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THE CARBONIFEROUS BIVALVED ENTOMOSTRACA.

PART I.

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A MONOGRAPH
OF THE
BRITISH FOSSIL
BIVALVED ENTOMOSTRACA
FROM THE
CARBONIFEROUS FORMATIONS.

BY
PROFESSOR T. RUPERT JONES, F.R.S., G.S., &c. &c. ;
JAMES W. KIRKBY, ESQ., &c. &c. ;
AND
PROFESSOR GEORGE S. BRADY, M.D., F.R.S., F.L.S., &c. &c.

PART I.
THE CYPRIDINADÆ AND THEIR ALLIES.

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J. E. ADLARD, BARTHOLOMEW CLOSE.

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A MONOGRAPH
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THE CARBONIFEROUS BIVALVE ENTOMOSTRACA
OF
GREAT BRITAIN AND IRELAND.

PART I.—THE CYPRIDINADÆ AND ALLIED GROUPS.

INTRODUCTION.

THE classification of the very numerous Bivalved Entomostraca found in the Carboniferous Limestones, Shales, and Ironstones, and submitted to our examination by numerous friends and correspondents, has been no easy task. Much as, at first sight, the fossil oval carapace-valves, notched on the anterior edge, may resemble some of the existing *Cypridinadæ*, we have to recollect that, even among the latter, generic discrimination by means of the shell (test or bivalved carapace) is almost impossible. So great is the modification of the shape of valves in any one group, and so little is the persistency among them of any one feature or character, or any set of features, that, except in a very general manner, we may not even take either the "notch" or the contour as a guide, not knowing the soft parts of the animal, remarkable as the similarity may sometimes be between the old and the modern shells.

It is impossible to group many even of the recent "notched" forms under the genus *Cypridina*, in accordance with the requirements of natural classification, by regarding only one character; for from the limbs and other organs are taken the main features of distinction between *Cypridina*, *Philomedes*, *Bradycinetus*, and *Asterope*, all formerly grouped as *Cypridinæ*. Evidently, therefore, we cannot say for certain that the extremely old *Cypridinadæ* of the Carboniferous Period, which preceded those of our day by countless generations, susceptible of numberless variations, are generically the same as those now living.

To escape this difficulty, and not to fall into error, we once thought of adopting such a term as "Cypridinopsis" for all these Cypridina-like forms, whether really allied to one more than to another of the genera above alluded to—relationships which the absence of the limbs prevents us from defining with exactness. But several subgeneric terms

would have been required, indicating apparent approximations to existing forms; and no advantage in the saving of names would have accrued.

Making the most, then, of the carapace-characters among the fossil Cypridina-like species, and referring them on that basis to their apparent congeners among the published existing forms, we find several which appear to be related to *Cypridina* (both oval and pyriform), and a few to *Bradycinetus* and *Philomedes*. *Rhombina* is a related Cypridinad. Five kinds of Cypridinal carapace among the Carboniferous specimens have additional features, constituting distinctive characters not known among recent Cypridinads; and thus give grounds for *Cypridinella*, *Cypridellina*, *Cypridella*, *Cyprella*, and *Sulcuna*. Two well-marked mutual allies, *Entomoconchus* and *Offa*, are neighbours of the *Cypridinadæ*; and the recent *Polycope* is represented. Others of more obscure relationship occur, such as *Entomis*, with its deep dorsal sulcus.

We need not hesitate in carefully referring these recent and fossil Entomostraca to the same zoological groups, inasmuch as *Cythere* and *Bairdia* are represented by even Silurian carapace-valves; and we may add that *Cypridinadæ* (not yet described) occur in the Upper Silurian strata of the Pentland Hills in Scotland, and in the old pebbles of Silurian or Devonian quartzite in the Conglomerate of Budleigh-Salterton in Devonshire.

Taking, then, the simply notched, oval, oblong, and pyriform specimens as *Cypridinæ*, we find a peculiarly notched and oval species representing *Bradycinetus*, and some oblong impressed specimens equal to *Philomedes*. A modification of the pyriform *Cypridinæ* by the projection of the antero-ventral region marks *Cypridinella*; intervention of a subcentral tubercle gives us *Cypridellina*; and the superadded nuchal furrow, with augmented tuberculation, characterizes *Cypridella*. The tubercle is foreshadowed in an occasional specimen of *Cypridina*, and we see the nuchal impression faintly in the *Philomedes*; but, with the high probability that the limbs differed, we take these slight links in their broadest developmental sense, and not as indicating direct alliance.

The addition of an external annulated ornament brings us from *Cypridella* to *Cyprella*; and *Sulcuna* differs from *Cypridella* in its peculiar sulcus.

Returning to *Cypridina* we trace modifications of the antero-inferior region, beneath the "notch," either by a lessening (as in our *C. brevimentum*), such as obtains in most of the recent forms, or by increased projection, faintly exhibited in the living *C. Zelandica*, Baird, and *C. luteola*, Dana, but in many of the fossils so extremely produced that the antero-ventral quarter stands out like the prow of such an armoured ship as the modern "Ram," typified by the American "Merrimac" and "Monitor." This modification characterizes our *Cypridinella*.

In another direction the Cypridinal carapace, becoming very gibbous and subquadrate or globose, has a faint "notch," but a long vertical "gape," and is recognized as *Entomoconchus*; further, in this kind of subglobose carapace, with the "sinus" present, but the "gape" reduced to a minimum, we have *Offa*.

The recent *Polycope*, characterized by its limbs as belonging to a different family to that of the *Cypridinadæ*, has a globose shell, with no notch, only an obsolete sinus; and among the Carboniferous fossils there are several to match this kind of carapace. There are also some oblong forms, with oblique ends, which we name *Rhombina*, and believe to be related both to *Cypridina* and to some older genera known in the Silurian rocks of Bohemia.

To render the recognition and classification of the recent and fossil *Cypridinadæ* and their allied groups more clear, we here indicate what is known of the existing forms, especially as far as the features of the *Carapace* are concerned.

The OSTRACODA are divided by G. O. Sars and G. S. Brady into four great groups.

I. PODOCOPA, comprising the *Cypridæ* and the *Cytheridæ*.—"This is by far the most extensive of the four sections, including all the freshwater and a vast majority of the marine Ostracoda, and embracing all the forms classed by the earlier writers under the two great genera *Cypris* and *Cythere*" (Brady, p. 355). The characters based on limbs and other organs are enumerated at p. 355, &c., of Mr. G. S. Brady's memoir "On the Recent British Ostracoda," in the 'Trans. Lin. Soc.,' vol. xxvi (1868).

1. *Cypridæ*.—"Valves mostly thin and smooth, more or less sinuate below" (Brady, *op. cit.*, p. 359).
2. *Cytheridæ*.—"Shell mostly hard and compact, calcareous; surface generally more or less rough and uneven, occasionally quite smooth" (Brady, *op. cit.*, p. 393).

II. MYODOCOPA, embracing the *Cypridinadæ* and *Conchæciadæ* [and the *Entomconchidæ*.]—"This group comprises the forms of which the genus *Cypridina* is the type, the characters indicating a higher organization and presenting well-marked differences, which show an approach to the higher order Branchiopoda" (Brady, *op. cit.*, 355).

1. *Cypridinadæ*.—"Shell mostly hard and compact in structure, smooth or punctate, and sometimes beset with short hairs, notched at the antero-inferior angle, so that when the valves are closed there remains still a large aperture for the protrusion of the lower antennæ" (Brady, *op. cit.*, p. 462).

1. CYPRIDINA, *Milne-Edwards*.

"Carapace produced in front into a more or less prominent beak, with a subjacent hollow or notch facing the ventral margin" (Brady, 'Trans. Zool. Soc.,' vol. v, p. 386).

“Shell smooth, thin, and flexible; notch shallow; its posterior extremity only slightly exerted” (Brady, ‘Proc. Zool. Soc.,’ 1871, p. 291). Looking at the series of recognized *Cypridinæ*, we are inclined to think that there are two leading forms of carapace: 1. The elongate-pyriform, such as *C. Reynaudii*, *C. elongata*, and *C. Bairdii*; and, 2, the oval-oblong, such as *C. Norvegica* and *C. Japonica*.

2. PHILOMEDES, *Lilljeborg*.

“Valves elongated, thin; notch broad; anterior extremity obtuse” (Brady, p. 462). “Shell of moderate strength and density” (Brady, ‘Proc. Zool. Soc.,’ 1871, p. 291).

3. ASTEROPE,¹ *Philippi*.

“Shell elongated, fusiform, or subcylindrical; beak rounded, not at all produced” (Brady, ‘Trans. Lin. Soc.,’ vol. xxvi, p. 464; *Cylindroleberis* and *Asterope*, ‘Proc. Zool. Soc.,’ 1871, p. 292). This genus appears to be one of the most consistent in form and structure of carapace.

4. BRADYCINETUS, *G. O. Sars*.

“Shell thicker and more compact than in the preceding genera (*Asterope* and *Philomedes*); notch deep, with setose margins” (Brady, ‘Trans. Lin. Soc.,’ xxvi, p. 466). “Shell much denser than in *Cypridinæ*, punctate; notch deep” (Brady, ‘Proc. Zool. Soc.,’ 1871, p. 291).

5. EURYPYLUS, *G. S. Brady*.

“Valves hard, calcareous; closely pitted on the surface, without a notch. Carapace rounded (oval) on side view; anterior end slightly produced, with a short blunt beak; posterior rounded; seen from above clavate, broadly rounded in front, and attenuate behind” (Brady, ‘Les Fonds de la Mer,’ 1869, p. 141). Though little is known of the soft parts, Mr. Brady is satisfied that *Eurypylus* is a Cypridinad.

¹ Mr. Brady thinks that this genus might with propriety be made the type of a distinct family.

2. *Conchæciadæ*.—"Shell very thin and flexible, neither horny nor calcareous, but almost membranaceous, more or less distinctly notched and emarginate in front, forming an orifice, through which, as in the preceding family, the lower antennæ are protruded whilst swimming" (Brady, *op. cit.*, p. 468).

1. CONCHÆCIA, *Dana*.

"Valves elongated [subrectangular in outline], produced in front into a beaked process; shell finely reticulated, or marked with concentric striæ; very slightly pilose. Dorsal surface of the carapace flattened in front, sometimes slightly excavated and keeled" (Brady, *op. cit.*, p. 469).

2. HALOCYPRIS, *Dana*.

Valves thin, subquadrate, saddle-shaped; more or less beaked in front at the upper angle.

3. *Entomoconchidæ*.¹

Carapace strong and large, gibbous, subquadrate or suborbicular in side-view.

1. ENTOMOCONCHUS, *M' Coy*. [Known only in the fossil state.]

Carapace subglobose, hinged by overlap; notched in front with a slight beak, and long, vertical, interrupted gape.

2. HETERODESMUS, *G. S. Brady*.

"Carapace subglobose. Dorsal margin slightly arched, forming at its extremities two largely developed hinge-processes; the anterior process somewhat waved and scroll-like; the posterior a truncate cone, projecting directly upwards. Ventral margin strongly arched" (Brady, 'Trans. Zool. Soc.,' vol. v, p. 387). Mr. Brady regards *Heterodesmus* as closely related to the *Cypridinadæ*, though not yet wholly elucidated; and he has suggested the alliance with *Entomoconchus* as above.

¹ G. S. Brady, 'Trans. Linn. Soc.,' vol. xxvi, 1868, p. 358.

III. CLADOCOPA, having the *Polycopidæ* only.—“The type of this group is *Polycope*, a genus recently described by G. O. Sars, which occurs on some parts of the coasts of the British Islands and Norway, and in the Mediterranean” (Brady, ‘Trans. Lin. Soc.’ xxvi, p. 356).

1. *Polycopidæ*.—“Valves subequal, thin, not notched in front” (Brady, *op. cit.*, p. 470).

POLYCOPE, *G. O. Sars*.

“Valves rounded, ventricose, thin, and fragile, corneo-calcareous” (Brady, *op. cit.*, p. 470).

IV. PLATYCOPA, having the *Cytherellidæ* only.—“This group is typified by the genus *Cytherella*, known, before Sars’s researches, only from fossil specimens” (Brady, *op. cit.*, p. 317).

1. *Cytherellidæ*.—“Valves unequal, very thick and calcareous, not notched in front” (Brady, *op. cit.*, p. 472).

CYTHERELLA (*Jones*), *Bosquet*.

“Valves elongated, flattened, thick and hard, very unequal; the right much larger than the left, and overlapping throughout the whole circumference, presenting round the entire inner margin a distinct groove, into which the valve of the opposite side is received” (Brady, *op. cit.*, p. 472).

The following Synopsis of existing Genera and Species will aid the student in his search through the somewhat scattered bibliography of those recent *Ostracoda* which are concerned with the present Part of our Monograph.

I. CYPRIDINADÆ, *Baird*, 1850.1. CYPRIDINA, *Milne-Edwards*, 1837.

- CYPRIDINA* *REYNAUDII*, *Milne-Edwards*, 1837. *Hist. Nat. Crust.*, vol. iii, p. 409, pl. xxxvi, figs. 5, 5*a*, 5*b*; and *Annotations de l'Hist. des Anim. s. Vert. de Lamarck*, vol. v, 1838, p. 178. Indian Ocean.
- * *ZELANDICA*, *Baird*, 1850. *Proc. Zool. Soc.*, 1850, p. 102, p. 257, *Annulosa*, pl. xvii, figs. 11—13. New Zealand.
- *LUTEOLA*, *Dana*, 1855. *U. S. Expl. Exped. Crust.*, p. 1291, pl. xci, figs. 1 *a—n*. Sooloo Sea.
- * *PUNCTATA*, *Dana*, 1855. *Ibid.*, p. 1293, pl. xci, figs. 2 *a, b*. Sooloo Sea.
- * *GIBBOSA*, *Dana*, 1856. *Ibid.*, p. 1295, pl. xci, figs. 4 *a—e*. Pacific.
- * *FORMOSA*, *Dana*, 1855. *Ibid.*, p. 1296, pl. xci, figs. 5 *a—h*. Samoan Islands.
- *NORVEGICA*, *Baird*, 1860. *Proc. Zool. Soc.*, 1860, p. 200, *Annulosa*, pl. lxxi, figs. 4, 4 *a—d*; *Brady, Proc. Zool. Soc.*, 1871, p. 292. North Atlantic.
- * *OVUM*, *Baird*, 1860. *Proc. Zool. Soc.*, 1860, p. 201, *Annulosa*, pl. lxxi, figs. 3, 3 *a, b*. Chinese Sea.
- * *ALBOMACULATA*, *Baird*, 1860. *Ibid.*, figs. 1, 1 *a, b*. Swan River, W. Australia.
- * *GODEHAVI*, *Baird*, 1860. *Ibid.*, figs. 2, 2 *a—c*. Madras.
- *MESSINENSIS*, *Claus*, 1865. *Ueber die Organization der Cypridinen*, *Zeitsch. f. wissensch. Zool.*, vol. xv, Heft 2, p. 143, &c., pl. 'x. Mediterranean.
- *JAPONICA*, *Brady*, 1866. *Trans. Zool. Soc.*, vol. v, p. 386, pl. lxii, figs. 8 *a—d*. Japan.
- *ELONGATA*, *Brady*, 1866. *Ibid.*, figs. 9 *a—d*. Chinese Sea.
- *BAIRDII*, *Brady*, 1866. *Ibid.*, figs. 7 *a—m*. Chinese Sea.

* Further knowledge of the soft parts of these species, and a full comparison with what is known of the others, is wanted for the exact determination of their generic relationship. G. O. Sars assigns *Cypridina messinensis*, Claus, and *C. luteola*, Dana, to *Cypridina*; Grube's species probably to *Asterope*; Costa's species and Baird's *C. Adamsii* probably to a distinct genus, or else to *Asterope*; and *C. olivacea*, Dana, to *Philomedes* (as suggested by Dr. Baird previously).—G. S. B.

2. ASTEROPE, *Philippi*, 1840.

- ASTEROPE ELLIPTICA, *Philippi*, 1840. *Archiv für Naturgeschichte*, 1840, p. 188, pl. iii, figs. 9—11; *Annals Nat. Hist.*, vol. vi, p. 94, pl. iii, figs. 9—11. Mediterranean.
- * ? MEDITERRANEA (*Costa*), 1845. *Illustraz. Cypridina, &c.*, *Dono Accad. Pontan. agli Sc. Ital.*, p. 57, &c., pl. i. Mediterranean.
- * ? ADAMSI (*Baird*), 1848. *Ann. N. H.*, ser. 2, vol. i, p. 22, pl. vii, fig. 1. South Atlantic.
- MARIE (*Baird*), 1850. *Proc. Zool. Soc.*, 1850, p. 257, *Annulosa*, pl. xvii, figs. 5—7; Brady (*Cylindroleberis*), *Trans. Linn. Soc.*, vol. xxvi, p. 465, pl. xxxiii, figs. 18—22, pl. xli, fig. 1; *Proc. Zool. Soc.*, 1871, p. 295. North Atlantic, Channel Islands, and Bay of Biscay.
- * ? OBLONGA (*Grube*), 1859. *Archiv Naturgesch.*, 35 Jahrg., vol. i, pp. 330—335, pl. xii, figs. 2—5. Adriatic.
- TERES (*Norman*), 1861. *Ann. N. Hist.*, ser. 3, vol. viii, p. 280, pl. xiv, fig. 10; Brady (*Cylindroleberis*), *Tr. Linn. Soc.*, vol. xxvi, p. 465, pl. xxxiii, figs. 6—9, pl. xli, fig. 2; *Proc. Zool. Soc.*, 1871, p. 295. North Atlantic.
- ABYSSICOLA, *G. O. Sars*, 1869. *Nye Dybvandscrustaceer fra Lofoten*, p. 26. Norway.
- NORVEGICA, *G. O. Sars*, 1869. *Undersøgelser over Christianifiordens Dybvandsfauna anstillede paa en i Som. 1868*, p. 53. Norway.

3. PHILOMEDES, *Lilljeborg*, 1853.

- PHILOMEDES ? * ALBIMACULATA (*Nicolet*¹), 1849. In *Cl. Gay's Hist. fisica y politica de Chile*, vol. iii, p. 294, *Atlas, Crustaceos*, pl. iv, fig. 6. Marshes of Chile.
- ? * CERULEA *vel* VIOLACEA (*Nicolet*), 1849. *Ibid.*, fig. 6b. Marshes of Chile.

¹ As to Nicolet's species, it would seem impossible, without information as to the limbs, to say anything definite; the antennæ do not look like *Philomedes*, unless they be those of the female, which is not usually got on the surface.—G. S. B.

- PHILOMEDES INTERPUNCTA (*Baird*), 1850. Proc. Zool. Soc., 1850, p. 257, Annulosa, pl. xvii, figs. 8—10; Brady, Tr. Linn. Soc., vol. xxvi, p. 463, pl. xxxiii, figs. 10—13, pl. xli, fig. 3; Proc. Zool. Soc., 1871, p. 293, pl. xxvi, figs. 1—5 (= *Philomedes longicornis*, Lilljeborg, Norman, and G. O. Sars). North Atlantic, English Channel, and Bay of Biscay.
- OLIVACEA (*Dana*), 1855. Expl. Exped. Crust., p. 1294, pl. xci, figs. 3 *a*, *b*. Sooloo Sea.
- FOLINII, *Brady*, 1871. Proc. Zool. Soc., 1871, p. 294, pl. xxvii, figs. 1—3. Bay of Biscay.

4. BRADYCINETUS, *G. O. Sars*, 1865.

- BRADYCINETUS MACANDREI (*Baird*), 1850. Brit. Entom., p. 179, pl. xxii, figs. 1 *a*—*g*; Brady, Tr. Lin. Soc., vol. xxvi; p. 468, pl. xxxiii, figs. 14—17, pl. xli; fig. 4. North Atlantic.
- BRENDA (*Baird*), 1850. Brit. Entom., p. 181, pl. xxiii, figs. 1 *a*—*g*; Brady, Tr. Lin. Soc., 1868, vol. xxvi, p. 466, pl. xxxiii, figs. 1—5, pl. xli, fig. 5; Proc. Zool. Soc., 1871, p. 292 (= *Cypridina globosa*, Lilljeborg; *Bradycinetus globosus*, Sars; *Asterope groenlandica*, Fischer; *Cypridina excisa*, Stimpson). North Atlantic, Bay of Fundy, and Bay of Biscay.
- LILLJEBORGII, *G. O. Sars*, 1865. Oversigt af Norges marine Ostracoder, p. 112. Norway and North Atlantic.

5. EURYPYLUS, *G. S. Brady*, 1869.

- EURYPYLUS PETROSUS, *Brady*, 1869. Les Fonds de la Mer, livr. 9, p. 141, pl. xviii, fig. 12. St. Vincent Roads, Cape Verde.

II. CONCHÆCIADÆ, *G. O. Sars*, 1865.1. CONCHÆCIA, *Dana*, 1855.

- CONCHÆCIA AGILIS, *Dana*, 1855. Expl. Exped. Crust., p. 1299, pl. xci, figs. 6 *a*—*e*. Atlantic.
- ROSTRATA, *Dana*, 1855. Ibid., p. 1300, pl. xci, figs. 7 *a*—*f*. Pacific.
- OBTUSATA, *Sars*, 1865. Oversigt, &c., p. 118; Brady, Trans. Lin. Soc., vol. xxvi, p. 470, pl. xli, fig. 9. North Atlantic.

2. HALOCYPRIS, *Dana*, 1855.

- HALOCYPRIS INFLATA, *Dana*, 1855. Expl. Exped. Crust., p. 1301, pl. xci, figs. 8 *a—k*.
Atlantic.
- BREVIROSTRIS, *Dana*, 1855. Ibid., p. 1303, pl. xci, figs. 9 *a—c*. Atlantic.
- ATLANTICA, *Lubbock*, 1856. Tr. Entom. Soc., new ser., vol. iv, p. 34,
pl. xii, figs. 1—8. North Atlantic.
- MESSINENSIS, *Claus*, 1865. Zeitsch. wiss. Zool., vol. xv, p. 399, pl. xxx.
Mediterranean.

III. ENTOMOCONCHIDÆ, *G. S. Brady*, 1868.1. HETERODESMUS, *Brady*, 1866.

- HETERODESMUS ADAMSII, *Brady*, 1866. Trans. Zool. Soc., vol. v, p. 387, pl. lxii,
figs. 6 *a—h*. Japan.

IV. POLYCOPEIDÆ, *G. O. Sars*, 1865.1. POLYCOPE, *Sars*, 1865.

- POLYCOPE ORBICULARIS, *G. O. Sars*, 1865. Oversigt af Norges marine Ostracoder, p.
122; *Brady*, Tr. Linn. Soc., vol. xxvi,
p. 471, pl. xxxv, figs. 53—57. Norway
and North Atlantic.
- ? DENTATA, *Brady*, 1868. Ibid., p. 472, pl. xxxv, figs. 58, 59. Shetland.
- PUNCTATA, *G. O. Sars*, 1869. Nye Dybvandscrustaceer fra Lofoten, p. 27.
Norway.
- sp. indet., *Brady*, 1869. Ann. N. H., ser. 4, vol. iii, p. 47, pl. vii, figs. 15,
16. Crete.
- COMPRESSA, *Brady* and *Robertson*, 1869. Ibid., p. 372, pl. xxi, figs. 5—8.
Atlantic and Mediterranean.

V. CYTHERELLIDÆ, *G. O. Sars*, 1865.1. CYTHERELLA (*Jones*), *Bosquet*.

The Synopsis of Species for this Genus will be given in a subsequent portion of this Monograph.

DESCRIPTION OF THE CARBONIFEROUS GENERA AND SPECIES.

I.—CYPRIDINA, *Milne-Edwards*.

- CYPRIDINA, *Milne-Edwards*, 1837.
 — *Baird*, 1840, 1848, 1850, 1860.
 DAPHNIA, *M'Coy*, 1844.
 CYPRIDINA, *Costa*, 1845.
 CYPRELLA, *Bosquet*, 1847, 1852, 1854.
 CYPRIDINA, *Jones*, 1849, 1854, 1856, 1869.
 — *Adam White*, 1850.
 — *Dana*, 1855.
 — *Grube*, 1859.
 — *Claus*, 1865.
 — *G. S. Brady*, 1866, 1868.
 — *Jones and Kirkby*, 1866, 1867, 1871.
 — *G. O. Sars*, 1868, 1869.

Carapace-valves rather thin and horny in the recent specimens, more solid and calcareous when fossil; ovate, oblong-oval, elongate-oval, or pyriform; apiculate behind; notch distinct in front. The fossil are thicker than the recent shells; partly, at least, from mineralization. Muscle-spot frequently apparent.

The 'Monograph of the Tertiary Entomostraca of England' (Palæontogr. Soc.), 1856, p. 9, where treating of the Family *Cypridæ*, contains the following paragraph:—"I may here mention that *Cyprella* and *Cypridella*, of M. De Koninck, probably belong to a different group of the Entomostraca; that M. Bosquet's 'Cyprellæ' of the Cretaceous and Tertiary deposits are true *Cypridinæ*; and that De Koninck's 'Cypridina' (of the Carboniferous Limestone) is not the *Cypridina* of Milne-Edwards. In a courteous reply to an inquiry with which I lately troubled M. Milne-Edwards, he kindly informed me that the *Cypridina* described in the 'Hist. Nat. des Crust.' has really the antero-ventral notch so characteristic of the genus." With regard to this important point in the history of the genus, it is evident that, for want of the early indication of the presence of this character, several fossil forms have been wrongly allocated by palæontologists. Thus, besides noticing¹ that M'Coy's *Daphnia primæva* is a *Cypridina*, and that M. De

¹ See also 'Monog. Cretac. Entom., England' (Palæontogr. Soc.), 1849, pp. 3, 5, and 36.

Koninck's *Cypridina Edwardsiana* is a *Cypridella*, his *Cypridina annulata* a *Cyprella*, and his *Cypridina concentrica* an *Entomis*, and that numerous *Cytheræ* (Tertiary and Cretaceous) were formerly called "Cypridinæ," we must draw attention (as we have elsewhere) to the fact that none of the Devonian "Cypridinæ" which have given a name to a formation ("Cypridinen-Schiefer," &c.) are *Cypridinæ*, but for the most part *Entomides*, &c. See also "Palæoz. Biv. Entom.," Geol. Assoc., 1869, p. 4.

On the other hand, M. Bosquet's *Cyprella ovulata* and *C. Koninckiana*, from the Chalk of Maestricht ('Mém. Soc. Roy. Sciences Liège,' vol. iv, 1847, p. 373, pl. iv, figs. 4 and 5; and 'Mém. Commission Carte Géol. Neerlande,' vol. ii, 1854, pp. 124, 125), and his *Cyprella Edwardsiana*, from the Lower Tertiaries of France ('Mém. Cour. Acad. Roy. Belgique,' vol. xxiv, 1852, p. 132, pl. 6, fig. 14), are true *Cypridinæ*, as now understood by a wider knowledge of the genus, and especially the recognition of the notch and beak in M. Milne-Edwards's typical species. Among known recent species *Cypridina Bairdii*, G. S. Brady, is, perhaps, the nearest to the above-mentioned *Cypridinæ ovulata*, *Koninckiana*, and *Edwardsiana* (Bosquet).

For a list of the known recent species of *Cypridina* and their more important synonyms, see page 7.

1. CYPRIDINA PRIMÆVA (M'Coy). Plate II, figs. 24, 25, 26, 27 a—c, 28.

DAPHNIA PRIMÆVA, M'Coy,¹ 1844. Synops. Char. Carb. Foss. Ireland, p. 164, pl. xxiii, fig. 5.

CYPRIDINA — Jones, 1854. In Morris's Catal. Brit. Foss., 2nd ed., p. 104.

— — Jones and Kirkby, 1866. Annals Nat. Hist., ser. 3, vol. xviii, p. 41; 1867, Trans. Geol. Soc. Glasgow, vol. ii, p. 218, and vol. iii, Suppl., 1871, p. 27.

Carapace subequivalve, subglobose, or of a compressed egg-shape; oval in outline, nearly equilateral; notched anteriorly, at the middle, with a deep sinus and wide triangular gape (fig. 27 b). End-view compressed-oval. Edge view narrow-oval.

This much resembles *Cypridina Japonica*, Brady ('Trans. Zool. Soc.,' vol. v, pl. 62, fig. 8) in shape, but wants the posterior prickle or spur, and differs somewhat in the gape, which is cruciform in *C. Japonica*. It is still more like *C. Norvegica*, Baird ('Proc. Zool. Soc.' Annulosa, pl. 71, fig. 4); but in the latter the notch is smaller and the gape cordiform.

Fig. 27 a matches Prof. M'Coy's *Daphnia primæva* in shape and size (according

¹ Prof. M'Coy quoted the *Daphnoidia* of Hibbert ('Trans. Roy. Soc. Edin.,' 1834, vol. xiii, p. 180; *D. Hibberti*, Morris, 1843), as a synonym, but we do not see any relationship. Indeed, "*Daphnoidia*" appears to be indeterminable ('Annals N. H.,' l. c., p. 34), or it may be a crushed specimen of *Leperditia Scotoburdigalensis*. M'Coy mentions no special locality for *C. primæva*.

to the figure and description in the 'Syn. Char. Carb. Foss.'), being $1\frac{3}{4}$ by $\frac{3}{4}$ line (a line = $\frac{1}{10}$ inch).

Figs. 24—27 are brown bivalved carapaces from Braidwood, Carluke, Lanarkshire. They were found by Mr. John Young, amongst about 300, in a fish Coprolite,¹ collected by Dr. D. R. Rankin in an old "Opencast" at Braidwood Gill, Carluke, from a stratum containing *Beyrichia multilobata*, in the Lower Limestone Shale, and on or below the horizon of the First Calmy Limestone, 343 fathoms below the Ell Coal of the Carluke series. The Coprolite was about two inches by one in size and thickly charged throughout with the bivalve tests.

Smallest.—Length $\frac{1}{4}$; height $\frac{1}{4}$; thickness ? . Proportions $3\frac{1}{2} : 2$.

Largest.— " $\frac{1}{5}$; " $\frac{1}{8}$; " $\frac{1}{12}$. " 9 : 6 : 4.

Fig. 28 is from a cast in the Permian Limestone of Sunderland; there are two specimens in Mr. Kirkby's Collection. It closely resembles *C. primæva* in outline and contour, and is about $\frac{1}{10}$ inch in length.

We have also met with this species in the Poolvash Limestone of the Isle of Man (see p. 22).

So many of our fossil Entomostraca have been derived from the Carboniferous Formations of Scotland, particularly of Lanarkshire, by the energy and kind care of Dr. Rankin, Messrs. Grossart, Young, Armstrong, Thomson, Hunter, Robertson, and other friends, that we will here refer to sources of information on the stratigraphy of the Scotch Coal-fields.

At pages 33 and 34 of the 'Monograph of the Fossil Estheriæ' (Pal. Soc.), 1862, is a stratigraphical list of the Coal-measures of Lanarkshire, indicating the range of *Beyrichia*, *Estheria*, and *Leperditia* (there termed "Cytheropsis"). Mr. Grossart's *Cypridina* (350 fathoms below the Ell Coal) is also referred to at p. 34, and Dr. Rankin's specimen (239 fathoms) at p. 35.

A Synoptical Table or "Vertical Section of the Carboniferous Rocks in the neighbourhood of Glasgow, showing the distribution of the Bivalve Entomostraca," was published in the 'Trans. Geol. Soc. Glasgow,' vol. ii (1867), p. 225; and it was re-issued in an improved form in the Supplement of vol. iii, 1871, by Messrs. John Young and James Armstrong, descriptive of the vertical range and distribution of the Carboniferous Fossils of the West of Scotland.

A Tabular View of the Carboniferous System of Lanarkshire was given by Mr. T. Davidson, F.R.S., in the 'Geologist,' vol. ii, 1859, p. 466; and of the Lothians in the 'Geologist,' vol. iii, 1860, p. 239; and a still later conspectus of these Carboniferous Formations of East Scotland, by Mr. Geikie, was published in Murchison's 'Siluria,' 1867, p. 292, &c. See also the publications of the Geological Survey of Scotland.

¹ Mentioned also in the "Report of the Glasgow Geological Society's Meeting of January 25, 1866," in the 'Geological Magazine,' vol. iii, p. 133.

2. *CYPRIDINA RADIATA*. Sp. nov. Plate V, figs. 6 *a*—6 *f*.

Mr. John Young, of Glasgow, has found in a black shale of the Airdrie Blackband Ironstone of the "Upper Coal-measures" of the Glasgow district numerous rusty longitudinally oval *Cypridinæ*, much resembling *C. primæva* (especially figs. 25 and 27) in shape, but larger, with deeper and lower notch, and characterized by a beautiful radiate shell-structure. Being mostly squeezed in the shale, they vary in outline, in relative size, and in depth of notch.

The exterior bears a rough, blebby, reticulate surface, with minute subconvex meshes; and these are often broken away, leaving subhexagonal linear meshes. The inner laminae of the shell (brown) exhibit groups of vascular radii, consisting of about fifteen delicate furrows (and their casts), some bifurcate, radiating from a small round space (a pit, as seen from within), less distinct in some specimens and most apparent in the scaled interior of others. Where the furrows are coarse there are about seven or eight of these vascular stars across the valve, and nine or ten along its length, irregular and alternate, the ends of one set of rays just touching those of the neighbouring groups. The stars vary in size, and in the length, tenuity, straightness, and number of their rays, even in one specimen.

Length $\frac{1}{4}$, height $\frac{1}{6}$, thickness $\frac{1}{12}$. Proportions 12 : 8 : 3.¹

In this bituminous shale of the so-called "Freshwater Series" of the local Carboniferous group, thirty-three fathoms below the Ell Coal, besides *C. radiata*, are other smaller *Cypridinæ* (?) and *Beyrichia arcuata*, also *Anthracosia* and remains of Fishes and Reptiles.

Similar *Cypridinæ* with radiate structure have been discovered by Mr. W. Molyneux, F.G.S., of Burton-on-Trent, in laminated and rusty bituminous shales (of the "Hæmatite" series) belonging to the English Coal-measures, at Ipstones, North Staffordshire. In some soft, drab-coloured concretions in similar shales from Lowndes' Pit, Ipstones, Mr. Molyneux has also found a subglobular pitted *Cypridina* (imperfect), which may be of the same species.

3. *CYPRIDINA WRIGHTIANA*. Sp. nov. Plate II, figs. 14 *a*, *b*, *c*.

Carapace-valve oval-oblong, somewhat compressed, boldly curved above and behind, straight below; though indented with a large open sinus in front, the valves had but a very small gape. End view of carapace acute-obovate; edge-view narrow-oval.

¹ These measurements and proportions are taken from one of the best preserved specimens; but owing to the carapace-valves having been much pressed they may not be quite accurate.

Length $\frac{5}{24}$; height $\frac{1}{7}$; thickness $\frac{1}{12}$ inch. Proportions 10 : 7 : 4.

A grey shell in grey Carboniferous Limestone, Cork, Ireland; collected by Mr. Joseph Wright, F.G.S. It differs from *C. primæva* in its straight ventral edge, large open sinus, and small gape; and it is dedicated to its discoverer, one of the most enthusiastic of collectors and students of the Carboniferous and other fossils of Ireland. To Mr. Wright's energy and liberality we owe a very considerable portion of the large number of the Carboniferous Cypridinads, besides other Entomostraca, that have come under our examination.

4. CYPRIDINA BRADYANA. Sp. nov. Plate II, figs. 13 *a, b, c*.

Carapace-valve gently gibbous, subovate in outline, truncate in front, where the sinus cuts away, as it were, the lower portion of a semicircular curve, leaving a strong triangular beak and a perpendicular margin beneath it. Yet the gape or fissure does not seem to have been large (fig. 13 *b*). A slight local elevation or faint knob is expressed in the antero-dorsal region, somewhat modifying the otherwise symmetrically convex outline of that part of the valve. This slight tubercle is not without its meaning in relation to the far more extensively tuberculate and swollen *Cypridellæ* and *Cypridellinæ* hereafter to be noticed. End-view of carapace suboval; edge-view acute-ovate.

Length $\frac{1}{5}$; height $\frac{1}{8}$; thickness $\frac{1}{12}$. Proportions $9\frac{1}{2}$: 6 : 4.

This species, represented by a grey shell in grey limestone, differs markedly in contour and in form of "notch" from *C. Wrightiana* and its other associates in the Carboniferous Limestone of Little Island, Cork. It was also collected by Mr. Joseph Wright, F.G.S.; and it is named after our accomplished friend, Mr. G. S. Brady of Sunderland, who has favoured us with much help in the study of these and other fossil Entomostraca.

5. CYPRIDINA BREVIMENTUM. Sp. nov. Plate II, figs. 15—19.

Carapace compressed egg-shaped; valves varying in outline from oval (figs. 15 and 16) to oval-oblong (figs. 17—19); arched or curved on each margin, though sometimes nearly straight below; elliptically and often obliquely curved behind; broadly convex on the dorsal line; deeply cut by a sinus in front, with the lower (antero-ventral) region sloping away downwards and backwards with a curved outline. The smaller (younger) and most oval specimens (fig. 16, &c.) have the greatest loss in this region, and the relatively most projecting beak; and thus present an even more chinless outline than the larger indi-

viduals (figs. 19, &c.). A gape of moderate proportions (indicated in the outlines, figs. 16 *b* and 19 *b*) accompanies this deep sinus. Some valves (fig. 18) have a slight marginal rim on the ventral edge. End-view obovate; edge view compressed ovate, and nearly oblong-oval in the fine old specimen, fig. 19 *c*, which has its surface somewhat depressed across the middle.

In the males of *Philomedes interpuncta* (Baird), and in *Cypridina Reynaudi*, M.-Edwards, and *C. Bairdii*, Brady, the antero-ventral region of the carapace slopes away rapidly backwards, as in *C. brevementum*; but there are no other mutual characters of similarity.

This species, gregarious like many other Cypridinads, is evidently of common occurrence in the Mountain-limestone of Ireland, England, and Belgium. Taken according to gradations in shape—

Fig. 16 (the smallest) is a grey shell in grey limestone from Cork (Mr. Joseph Wright, F.G.S.). It is a fifth too large to be M'Coy's *Daphnia primæva*, and differs from it essentially in shape. We have a similar specimen from Visé (Belgium), thanks to our friend M. J. Bosquet, F.C.G.S. of Maestricht.

Fig. 15 is a grey shell, roughened by partial solution and weathering, and cracked (as shown in the figure), in grey limestone from Little Island, Cork; Mr. Joseph Wright, F.G.S.

Fig. 18 is a whitish weathered shell in grey Mountain-limestone from Parkhill, near Longnor, Derbyshire, associated with a small *Aviculopecten* and small bivalves. The specimen is in the Museum of the Geological Survey, Jermyn Street (Tablet $\frac{38}{11}$), where there are two others similar, one a cast and one with a film of shell remaining (fig. 19), from the same place.

Fig. 17 is a grey shell in the grey limestone of Cork, collected by Mr. Joseph Wright, F.G.S. This species is plentiful at Little Island.

Fig. 19 (the largest) is a black cast, retaining some straggling films and broken reticulations of shell-matter, in dark grey encrinital limestone, in which the constituent fossils are partially darkened with bitumen, from Parkhill, Longnor, Derbyshire. It is on Tablet $\frac{38}{11}$ in the Museum of the Geological Survey, London. [The beak over the notch is rather sharper in the specimen than in the figure.]

Fig. 16	length	$\frac{1}{5}$;	height	$\frac{1}{9}$;	thickness	$\frac{1}{12}$ inch.	Proportions	9	: 5 $\frac{1}{2}$: 4.
Fig. 17	„	$\frac{2}{7}$;	„	$\frac{1}{6}$;	„	?	„	6 $\frac{1}{2}$: 4.	
Fig. 15	„	$\frac{1}{3}$;	„	$\frac{1}{5}$;	„	$\frac{1}{7}$	„	8	: 4 $\frac{1}{2}$: 3 $\frac{1}{2}$.
Fig. 18	„	$\frac{1}{3}$;	„	$\frac{5}{24}$;	„	$\frac{1}{6}$	„	7 $\frac{3}{4}$: 5	: 4.
Fig. 19	„	$\frac{5}{12}$;	„	$\frac{1}{4}$;	„	$\frac{1}{6}$	„	10	: 6	: 4 $\frac{1}{4}$.

In the Carboniferous Limestone of Caldby Island, South Wales, the late Mr. J. W. Salter observed a gregarious Cypridinad, either of this species or possibly *Polycope simplex*.

6. CYPRIDINA GROSSARTIANA, *J. and K.* Plate II, figs. 20 *a, b, c.*

CYPRIDINA GROSSARTIANA, *J. and K.*, 1867. Trans. Geol. Soc. Glasgow, vol. ii, p. 218; and vol. iii, Suppl., p. 27, 1871.

Carapace ovate-oblong; moderately gibbous, but compressed along the margins, especially anteriorly; broadest (deepest) in the front half; but the antero-dorsal or nuchal region suddenly sinks in before it curves off into the beak or penthouse over the strongly marked notch. The gape seems to have been small. End-view acute-oval; edge-view long-acute-ovate.

Length $\frac{7}{24}$; height $\frac{1}{5}$; thickness $\frac{1}{9}$ inch. Proportions $14\frac{1}{2} : 9 : 5$.

The nuchal depression, giving a somewhat hump-backed appearance to the carapace, is present also to a great or less extent in some recent Cypridinads. We know of no species like *C. Grossartiana* in form of valve and shape of beak.

We name this species after Mr. W. Grossart, Surgeon, of Salsburg, Lanarkshire, who collected it near Blackburn, a mile and a half south-east of Bathgate, Linlithgowshire, from ironstone-shale six feet above the "Eurypterus Limestone,"¹ and 345 fathoms under the Ell Coal.

7. CYPRIDINA YOUNGIANA. Sp. nov. Plate II, figs. 11 *a—c.*

Carapace-valve broadly oblong; subcompressed, semicircular behind; curved below; nearly straight on the back; posterior broader and fuller than the anterior, where a neat median notch (the projection is slightly lessened by injury in this specimen) forms a large gape (fig. 11 *b*).

The specimen consists of a cast of the interior, retaining a small fragment of the shell posteriorly, and showing a distinct, large, radiate Muscle-spot in the antero-ventral region. The radii are longer on the hinder than on the front half of the spot, the centre of convergence being towards the front. End-view of the carapace acute-oval; edge-view compressed ovate, broadest behind.

Length $\frac{2}{7}$; height $\frac{1}{5}$; thickness $\frac{1}{8}$ inch. Proportions $13 : 9\frac{1}{2} : 6$.

This was found by Mr. James Thomson, of Glasgow, at Gare, Carlùke, in the Upper Limestone-shale, 202 fathoms below the Ell Coal. It is named after Mr. John Young, the energetic Assistant-curator of the Hunterian Museum, Glasgow, who has worked assiduously in collecting, classifying, and elaborating the Carboniferous Entomostraca of the Glasgow District.

¹ This is a local limestone, found at Kirkton, near Bathgate, and appears to be associated with the limestones at the bottom of the Scotch Coal-measures. It was noticed by Dr. Hibbert, in 'Trans. Roy. Soc. Edinb.,' vol. xii.

8. CYPRIDINA PHILLIPSIANA, Jones. Plate II, figs. 4, 5, 9.

CYPRIDINA PHILLIPSIANA, Jones, 1870. Monthly Microsc. Journ., vol. iv, p. 185,
 pl. lxi, fig. 8 a, b.
 — — — J. and K., 1871. Trans. Geol. Soc. Glasgow, vol. iii,
 Suppl., p. 27.

Carapace subglobose, symmetrically convex (or nearly so), the amount of convexity somewhat variable; broadly oval in outline, with nearly equal ends, except that one (anterior) is notched, above the middle line, with a long, curved, shallow sinus, accompanied by a decided, though small, gape of the valves. Surface smooth. Muscle-spot oval, radiate, strong on the casts, and visible on the shell; like that in Baird's *Cypridina albomaculata* and *C. Adamsii*.

Fig. 4. Length $\frac{1}{4}$; height $\frac{1}{5}$; thickness $\frac{1}{8}$ inch. Proportions 11 : 9 : 6.

Fig. 5. „ $\frac{1}{6}$; „ $\frac{1}{7}$; „ „ $8\frac{1}{2}$: 7.

Fig. 9. „ $\frac{1}{5}$; „ $\frac{1}{7}$; „ $\frac{1}{7}$ „ „ 9 : 7 : 7.

Shells and casts of this species (dedicated to Prof. John Phillips, F.R.S., whose name is so intimately connected with Carboniferous fossils and Geology in general) are not uncommon in the Carboniferous Limestone near Glasgow, and it occurs also in that of Middleton, Co. Cork, Ireland (Mr. Joseph Wright), and of Visé, in Belgium (British Museum).

Fig. 5. This specimen (small) retains a part of the shell (white and showing reticulate structure), in grey Carboniferous Limestone, with pieces of Trilobite and a Coral, from Gare, Carluke (Dr. Rankin). This specimen has a minute circular depression, on the junction of the valves, at the postero-ventral curve, probably representing the place of a spine or prickle.

Fig. 9. From a dark-grey limestone at Carluke (Dr. Rankin), retaining part of the whitened shell, and showing a faint, vertical, ventral depression [not visible in the figure].

Fig. 4, the largest, is a cast with filmy remnants of white shell at the muscle-spot and edges; also in a dark-grey limestone from Carluke (Mr. J. R. S. Hunter).

To this species we refer a small subquadrate bivalved specimen in ironstone from the Upper Limestone-shale, 290 fathoms below the Ell Coal, at Robroystone, near Glasgow, in Mr. John Young's collection, and formerly catalogued by us as "*Entomoconchus*," 'Glasgow List,' 1871, p. 28; see also 'Geol. Mag.,' vol. ii, p. 277.

9. CYPRIDINA HUNTERIANA. Sp. nov. Plate V, figs. 3 a, 3 b, 3 c.

Mr. John Young has obtained from the Main Post Limestone (366 fathoms below the Ell Coal) of Braidwood, Carluke, a relatively large specimen (cast) subquadrate in

outline, somewhat compressed, being less convex than *C. Phillipsiana*, and notched with a deeper sinus in the middle of the front edge. It bears a large, circular, radiate Muscle-spot rather higher up than in figs. 5 and 9 of Pl. II. There is also present a considerable depression or nuchal furrow, in the anterior third of the dorsum, above the muscle-spot.

Size— $\frac{1}{6}$ inch long.

We name this species after Mr. J. R. S. Hunter, of Beaushields, near Carluke, who, with Dr. Selkirk, has successfully worked the Braidwood Limestone, and added much to our knowledge of its palæontology. Mr. Hunter has obtained numerous *Entomostraca* from the débris of decomposed limestone in the large crevices traversing the rock. These once formed subterranean watercourses, and the limestone has been extensively disintegrated by the solvent and mechanical action of the water, the organic particles resisting destruction more successfully than the matrix.

10. CYPRIDINA THOMSONIANA, *J. and K.* Plate II, figs. 8 *a—c*; Plate V, fig. 4.

CYPRIDINA THOMSONIANA, *J. and K.*, 1867. Trans. Geol. Soc. Glasgow, vol. ii, p. 218; and vol. iii, Suppl., 1871, p. 27.

Carapace-valve subquadrate in outline; convex, especially below and behind; semi-circular below (ventral); broadest and elliptical above, with a slight angle at the small notch in the upper portion of the front edge (slightly modified by pressure in the specimen).

Posterior half fuller than the anterior, therefore the antero-dorsal region of the carapace is somewhat compressed. End-view and edge-view both ovate, but the latter the longer.

Surface reticulated all over (not partially as in fig. 8 *a*), with circular spots (Pl. V, fig. 4), somewhat like those of *Polycope simplex* from Braidwood.

Length $\frac{1}{4}$; height $\frac{1}{5}$; thickness $\frac{1}{6}$ inch. Proportions 11 : 9 : 8.

This species is named after Mr. James Thomson, of Glasgow, who found the specimen in a small ironstone nodule from the Upper Limestone-shale, 202 fathoms below the Ell Coal, at Gare, Carluke.

11. CYPRIDINA PRUNIFORMIS. Sp. nov. Pl. V, figs. 9 *a*, 9 *b*, 9 *c*.

Carapace plum-shaped; very similar to *C. Thomsoniana* (Pl. II, figs. 8 *a*, *b*, *c*), but larger, not truncated behind, less oblong and more elliptical in side-view, and notched lower down in front, with a somewhat larger beak and gape. Muscle-spot radiate, large.

Length $\frac{1}{3}$; height $\frac{1}{4}$; thickness $\frac{5}{24}$ inch. Proportions 15 : 12 : 10.

From the Carboniferous Limestone; Limerick (?). Visé, Belgium; Brit. Mus.

12. *CYPRIDINA SCORFACEA*, *J. and K.* Plate II, figs. 3 *a—d.*

CYPRIDINA SCORFACEA, *J. and K.*, 1871. Trans. Geol. Soc. Glasgow, vol. iii, Suppl., p. 27.

Carapace-valve oblong, compressed; ends rounded; one is broader than the other, and has a very slight but decided notch and projection near the top. Surface reticulate, with irregular hollow meshes, coarser towards the centre, which give the valve a rough scoriaceous appearance. (The lines traversing the surface in the fig. 3 *a* are cracks in the shell.)

Length $\frac{1}{4}$; height $\frac{1}{6}$; thickness $\frac{1}{12}$ inch. Proportions 11 : 8 : 4.

This is a somewhat crushed dark-brown specimen in a small ironstone concretion from the "Upper Limestone-shale," 202 fathoms below the Ell Coal, at Gare, near Carluke. In Dr. Rankin's collection.

Cypridina scoriacea and *C. Thomsoniana* in the high position of the notch resemble *C. (?) luteola*, Dana, but not in other respects.

13. *CYPRIDINA OBLONGA*. Sp. nov. Plate V, figs. 12 *a—c.*

Carapace subquadrate, compressed; valve oblong, slightly convex above and below, broader and flatter in front, narrower and more convex behind. A faintly marked and almost closed notch is apparent high up on the anterior margin. A very faint tubercle marks the middle of the valve. End-view acute-ovate; edge-view blunt and narrow-lanceolate.

Length $\frac{12}{48}$; height $\frac{7}{48}$; thickness $\frac{5}{48}$ inch. Proportions 12 : 7 : 5.

Collected by Mr. J. Wright, F.G.S., in the Carboniferous Limestone of Little Island, Cork.

On account of its general form this specimen was at first associated with *Rhombina*, but it wants the antero-dorsal projection and the retiring antero-ventral line, and its obscure notch was ultimately discerned. *Cypridina scoriacea* (*supra*) is one of the few compressed *Cypridinae* that offer any features for comparison.

II. CYPRIDINELLA. Genus novum.

The foregoing oval-oblong *Cypridinæ* (Nos. 1—13) have rounded hind quarters, with occasional evidences of a posterior spine; and their antero-ventral margin is rarely produced as far as the vertical line of the beak. Several recent analogues for the members of this group have been pointed out above. We now have to treat of another group in which the carapaces are not oblong; they have always a more or less produced hinder margin, either apiculate and indented, or spined at the postero-ventral margin of each valve; and their front margin is produced, often to a considerable extent, as a prow. Excepting that the oval-oblong *Cypridina Zelandica*, Baird, and *C. luteola*, Dana, have the lower front margin rather more prominent than other known living forms, we are without a recent analogue for these smooth, ovate, apiculate *Cypridinæ*; the long, sharp-tailed, recent forms, such as *C. Reynaudii*, *elongata*, *Bairdii*, &c., having no chin-like projection under the notch.

There is a closer alliance in form between the group under notice and the next two groups than between it and the foregoing group of *Cypridina* proper.

Judging, therefore, by the features of the carapace, which alone remains for our examination, we determine to separate the group in question as a genus, under the name CYPRIDINELLA, knowing that the differences of the soft parts of the Cypridinads are so great among the various forms as to be an additional basis of probability for a real generic distinction.

The following seven species are arranged according to the increasing projection of the lower front margin. *Cypridinella clausa* and *C. Maccoyiana* are apiculate and indented behind; the others elliptically rounded, and probably once spined.

1. CYPRIDINELLA CUMMINGII. Sp. nov. Plate II, figs. 23 *a—c*.

Carapace-valves highly convex, broad-ovate, attenuated posteriorly, deeply notched at the middle of the broad front. The carapace was egg-shaped, as thick as it was broad (high). Edge-view long-ovate; end-view broad-obovate.

This is somewhat like the recent *Cypridina Zelandica*, Baird, in shape; but the notch is too large, and the shell too convex and too narrow behind.

Length $\frac{5}{24}$; height $\frac{1}{6}$; thickness $\frac{1}{6}$ inch. Proportions 10 : 8 : 8.

Of the ovate *Cypridinadæ*, more or less distinctly apiculate behind, and produced to

a greater or less extent at the antero-ventral region, *Cypridina Zelandica* is the nearest recent type, and *Cypridinella Cummingii* is one of the most symmetrical and least exaggerated at the lower portion of the front, among the fossils; thus it more closely approximates to the said recent species than several of its associates in the Carboniferous Limestone, which become almost grotesque in the prow-like character of the front, as in naval rams, like the "Merrimac" and "Monitor." Thus they belong to a peculiar group, separate from *Cypridina* proper; indeed, the exact generic place of the recent type above mentioned has not been determined, for it was characterised by its carapace alone, before the study of the limbs had been carried to as great a nicety as naturalists now find necessary.

Two casts, somewhat ferruginous (one rather smaller than the figured specimen), occur in dark grey limestone, with Encrinites and small Shells, from Poolvash, Isle of Man, collected by the late Rev. J. G. Cumming, and presented by him to the Museum of the Geological Survey, London (Tablet $\frac{38}{5}$).

The late Mr. Cumming courteously informed us by letter (January 27th, 1864) that he regarded his *Cypridina ovalis*, from the Upper or Poolvash Limestone¹ (see 'The Isle of Man,' 1848, p. 355), found with other Entomostraca, referred to as *Cythere Phillipsiana*, De Koninck, *Cypridina annulata*, De Kon., and *Daphnia primæva* (?), M'Coy, in the same work, at pp. xxiv, 355, as being most probably the same as *C. primæva* (M'Coy).

In specimens of this same limestone, kindly sent to us by Mr. E. W. Binney, F.R.S., we have met with a valve, not well exposed, of *Cypridina primæva* (?), and an imperfectly preserved valve of a small compressed *Entomoconchus*.

2. CYPRIDINELLA SUPERCILIOSA. Sp. nov. Plate II, figs. 7 a—c; Plate V, figs. 7 a—d.

Carapace-valves convex, broad-oval or subovate; indented in front, above the middle, with a deep, narrow notch, slanting upwards, and bordered by a distinct marginal rim. The lower portion of the front of the figured specimen is partly imbedded and not fully exhibited in fig. 7a; but it stands out with a bold though variable curve in specimens from Settle and Bathgate. The ventral margin is bordered by a furrow and a rim in a large valve from Bathgate (Pl. V, fig. 7). Edge- and end-view are both sharp-ovate, the former the longer.

From Cork. Length $\frac{1}{4}$; height $\frac{1}{6}$; thickness $\frac{1}{7}$ inch. Proportions 11 : $8\frac{1}{2}$: 7.

From Bathgate. Length $\frac{1}{4}$; height $\frac{5}{24}$; thickness $\frac{1}{6}$ inch. Proportions 12 : 10 : 8.

Cypridinella superciliosa is less convex and rounder in side-view than *C. ovalis*; and its deep-cut and neatly bordered or rimmed notch is a good distinction. It has been

¹ Equivalent to the lower portion of the Mountain-limestone.

collected at Little Island, Cork, by Mr. Joseph Wright, F.G.S.; and Mr. W. Grossart, of Salsburg, has been so fortunate as to meet with several good specimens, and, indeed, gregarious masses, of this species in the light-grey Lower Carboniferous Limestone at Bathgate, Linlithgowshire. Like many other Bivalve Entomostraca, this species evidently constitutes a large proportion of its limestone mass. Mr. Burrow has also found this specimen in the Great Scar Limestone at Settle, Yorkshire.

The shells of some specimens in the Bathgate Limestone are marked with numerous minute, round, and vermicular white spots (fig. 7 *d*), beneath the smooth surface originally, both wearing away into roughness. Whether this be due to decay of structure or to parasitical borings we have not determined.

3. CYPRIDINELLA CLAUSA. Sp. nov. Plate III, figs. 3 *a—c*.

Carapace ovato-globose, indented in front with a broad shallow sinus and a very narrow notch, retreating obliquely upwards; bluntly pointed behind, with a slightly upturned apex, somewhat like the posterior angle of Dana's *Cypridina punctata* and others. Side-view subovate; edge-view acute-ovate; end-view broad-obovate.

Length $\frac{1}{3}$; height $\frac{1}{4}$; thickness $\frac{5}{24}$ inch. Proportions 8 : $5\frac{1}{2}$: 5.

A grey cast in the limestone of Little Island, Cork; collected by Mr. J. Wright, F.G.S. *C. clausa* occurs also at Middleton, Co. Cork.

4. CYPRIDINELLA BOSQUETI. Sp. nov. Plate III, figs. 6 *a, b, c*.

Carapace egg-like, very gibbose, almost equal-ended, but the front is excavated, high up, with well-marked sinus and notch, overhung by a small, neatly curved beak. Side-view ovate; edge-view broad-oval; end-view suborbicular, slightly flattened at the top.

Length $\frac{1}{4}$; height $\frac{1}{7}$; thickness $\frac{1}{8}$ inch. Proportions 11 : 7 : 8.

Somewhat like *Cypridina Norvegica* and *C. Zelandica* in general style, but more egg-shaped, too gibbose, with too much prow, and too small a gape, to resemble either closely.

This very neatly egg-shaped *Cypridinella*, represented by a cast from the white Upper Mountain-limestone of Visé, Belgium, sent to us by M. J. Bosquet, F.C.G.S., of Maestricht, we dedicate to him. By his liberality and friendly co-operation M. Bosquet has enabled us to study a large series of the typical Belgian Entomostraca, and bring them, as in this case, into direct comparison with our British specimens.

C. ovalis, *superciliosa*, *clausa*, and *Bosqueti*, have the ventral border semicircular or elliptical, with the anterior edge curved boldly upwards. The next group we have to

describe, namely, *C. Maccoyiana*, *Burrovii*, *Monitor*, and *vomer*, have the ventral margin, for the most part, less convex, and sometimes nearly flat, with a strongly projecting prow.

5. *CYPRIDINELLA MACCOYIANA*. Sp. nov. Plate III, figs. 13 *a*, *b*.

Carapace subglobose; suboblong in side-view; curved on the dorsal margin; bluntly apiculate, with a curved indentation, at the posterior angle; notched high up in front, with the lower portion of the anterior margin curving boldly outwards and downwards to meet the nearly straight, but somewhat sinuous, ventral border. Neither valve has an elevated tubercle, but the right valve is slightly more convex than the other in the specimen.

Length $\frac{1}{5}$; height $\frac{1}{8}$; thickness $\frac{1}{12}$ inch. Proportions 9 : 6 : 4.

This smaller species imitates *C. clausa* in some features, but not nearly enough to be taken for its young state. In the notch and front margin also they differ considerably. *C. Maccoyiana* is known by several shells and casts in the grey limestone of Little Island, Cork; collected by J. Wright, Esq., F.G.S.

We name this species after Prof. F. M'Coy, F.G.S., of Melbourne, who has brought very many genera and species of the Carboniferous Fossils of Ireland to notice, besides working extensively in other fields of Palæontology.

6. *CYPRIDINELLA MONITOR*. Sp. nov. Plate III, figs. 1 *a*, *b*.

Carapace subpyriform, boldly curved above and below, but most convex above; bluntly apiculate low down behind; sharply pointed in the prow-like antero-inferior projection; front sloping downwards and outwards from the dorsum to the prow, with a hollow curve, and having a small notch and beak above the middle line. At the posterior angle, in some specimens from Settle, there is the indication of the base of a posterior spine; and in some casts a small fissure exists between the valves, with a subtriangular stone core, which has reference to the former existence at this spot of a hollow projecting angle of the carapace-valves, such as occurs in several Bivalve Entomostraca, and among the *Cypridinæ* especially noticeable in the recent *C. Bairdii*, Brady, and the fossil *C. Koninckiana* (Bosquet).

Length $\frac{1}{3}$; height $\frac{1}{4}$; thickness $\frac{2}{7}$ inch. Proportions 15 : 11 : 13.

The prow of this compact carapace forcibly reminds us of the modern iron-clad mastless men-of-war typified by the American "Monitor."

Our figured specimen is from Visé, Belgium, thanks to our friend M. J. Bosquet, of Maestricht. It is a white cast, with a film of white shell here and there. Similar casts

accompany it, of grey limestone, smaller and less globose; and in Mr. Burrow's collection from Settle is another, also less globose than our fine Belgian specimen.

7. CYPRIDINELLA VOMER. Sp. nov. Plate III, figs. 11 *a—c*.

Carapace-valve obliquely subpyriform in outline; moderately convex; depressed and produced antero-ventrally, so that the front slopes down to the straight ventral edge, making a sharp prow like a ploughshare. A narrow, distinct, almost horizontal notch, cuts deeply into the upper half of the front; the edges of the notch are slightly rimmed or thickened. Edge-view of carapace acute-ovate; end-view oval.

Length $\frac{1}{4}$; height $\frac{1}{7}$; thickness $\frac{1}{9}$ inch. Proportions 11 : 7 : 5.

A grey shell, much weathered, from the limestone of Little Island, near Cork. Collected by Mr. J. Wright, F.G.S.

III. CYPRIDELLINA. Genus novum.

Carapace suboviform; notched in front; produced in the antero-ventral region; the valves locally swollen into a tubercle or circular subcentral hump above the median line.

Prof. De Koninck in 1844 founded a genus under the name of *Cypridella*, typified by his *C. cruciata*, which is a subquadrate Cypridinad with tubercular swellings on its valves and a strong nuchal furrow. His *Cypridina Edwardsiana* also has the furrow and tubercles, although associated with the same general shape as that of the smooth *Cypridinellæ* above described. Thus we are led to associate the two species in one genus, distinct from both *Cypridina* and *Cypridinella*, which, either among the recent species of the one or those described above of both genera, very occasionally show any feature analogous to the furrow or the tubercle (see *Cypridina Hunteriana*, Pl. V, fig. 3; and *C. Bradyana*, Pl. II, fig. 13).

We find, however, a set of Cypridinal forms corresponding in general features with the smooth suboviform *Cypridinellæ* (of which we take *Cypridina Zelandica*, Baird, to be an approximate existing type), but with the tubercle only, and without the nuchal furrow, present. These want, then, an important feature present in *Cypridella* of De Koninck; and we now divide them off as a group under the cognate name of CYPRIDELLINA, intermediate to *Cypridinella* (see above) and *Cypridella*, De Koninck, and, at the same time, to some extent related to *Cypridina*, Milne-Edwards.

We are aware that this distinction is in some degree artificial, and that (as before intimated) the presence of either nuchal furrow or subcentral hump, in faint degree, is to

be recognized among some of the foregoing genera and species. But, knowing how greatly these may have differed one from the other in the arrangement and details of limbs, and believing that tubercle and furrow were not without their meaning in the economy of the living animal, we prefer to seize on them as characteristics in these unknown organisms.

At the same time, if, besides relative size, the tubercles, and even the dorsal furrows, are the consequences of luxuriant growth, or of age, or of sex, we shall avoid error by giving similar trivial names to the seeming analogues in the three different series (1, smooth ; 2, tubercled ; and 3, tubercled, with furrow), taking care to be guided by the shape and general habit in making specific distinctions.

We have to add that some of the smaller individuals are tubercled, whilst their smooth analogue is of larger size ; for example, Pl. III, figs. 7 and 10, compared with fig. 11. Hence the tubercles are not the result of mere growth ; and the differences in other features should have the more weight.

There is evidently a great temptation to the condensing palæontologist to group together the three sections that we have here indicated, seeing that the tubercle is very slightly developed in Pl. III, fig. 5, that the extremely tuberculate *Cypridella Edwardsiana* (Pl. IV, fig. 4) approximates in shape to the smooth *Cypridinella Cummingii* (Pl. II, fig. 23), and that the furrow is almost obsolete in Pl. III, fig. 12. This last form, too, may be compared with *Cypridina Bradyana* (Pl. II, fig. 13) and Pl. IV, fig. 1, with Pl. III, figs. 9, 18, and 19 ; but, nevertheless, important differences, as to notch and prow, are evident, besides the presence of tubercles ; and none of the *Cypridinæ* nor *Cypridinellæ* are really comparable with a *Cypridellina* except in the case of *Cypridellina clausa* (Pl. II, figs. 2 and 3), and even there the notch differs, and the specimens are not good enough for a perfect decision.

Further, if these proposed *generic* distinctions fail, there is but a very narrow basis indeed for the separation of *species* in this extensive group of empty carapace-valves ; the differences of form being, for the most part, susceptible of a graduated arrangement, which, the tubercles and furrows being ignored, and the high probability of great variation in the soft parts being forgotten, would lead to an exceedingly artificial grouping, of but little use in reality. After all, it would be found necessary to recognize some subordinate divisions of long and short, thin or thick, oval or pyriform individuals, which would have still to stand for types of genera or sub-genera ; and, as we have stated already in alluding to the Cypridinads generally (pages 1 and 2), no saving in nomenclature would be made.

The following species are arranged according to the development of their lower front margin in projection and depth. *C. clausa*, *Burrovi*, and *galea* are more or less apiculate, with posterior indentation ; the others appear to have been spined on their rounded ends.

1. CYPRIDELLINA CLAUSA. Sp. nov. Plate III, figs. 2 *a*, *b*, *c*.

Carapace roughly egg-shaped; suboblong in side-view; sloping in front, obscurely notched (broken below in the specimen); hinder margin apiculate and strongly indented. Tubercle large, but not prominent. Edge-view subacute-ovate. Fig. 2 *b* shows the ventral aspect of this injured specimen; its dorsal aspect would be much like fig. 18 *b*, but more pointed behind, and showing the posterior depression. End-view sub-pentagonal.

In some respects this resembles *Cypridinella clausa*, Plate III, fig. 3, p. 23; but without the swelling of the tubercles its end-profile would have been orbicular instead of oval; and its notch is higher and more horizontal.

Length $\frac{1}{3}$ (probably more); height $\frac{5}{24}$; thickness $\frac{5}{24}$ inch. Proportions $7\frac{1}{2} : 5 : 5$.

A grey limestone cast from Little Island, Cork. Collected by Mr. J. Wright, F.G.S.

2. CYPRIDELLINA BURROVII. Sp. nov. Plate III, figs. 4 *a—e*; figs. 5 *a—c*; figs. 21 *a—e*.

We have here individuals of one species at three stages of growth, well preserved as far as internal casts can serve, and well illustrated for comparison; fig. 5 retaining portions of the shell. The smallest (youngest?) form, fig. 4, is subovate in profile; the largest (fig. 21) is ovate-oblong; less boldly curved above and below, more apiculate behind, and with a relatively smaller notch and gape than the other. Both are sub-oviform, with subhexagonal end-view, and pyriform edge-view; and each had posterior spines, as they retain the cast of their united base, which, however, in fig. 4 *d*, is rather higher up than in fig. 21 *e*. The prow, also, of fig. 4 *c* projects somewhat further beyond the beak than in fig. 21 *c*, and the hind-quarters of fig. 21 *e* (the largest specimen) are rounder than those of fig. 4 *d*.

None of these differences, however, in the presence of the many similarities, can be of specific importance. Moreover, there is the intermediate form presently to be described; and we have, besides, an individual, still smaller than fig. 4, of the same form from Ireland, which is rather more apiculate behind, and two middle-sized specimens (smaller than fig. 5) from Settle, whence the three figured fossils came. From M. Bosquet's Belgian collection, also, we have been favoured with two casts, one in the grey and one in the white limestone of Visé, similar to fig. 4.

The specimen of intermediate size, fig. 5, has a subglobose, nearly egg-shaped

carapace, semicircular above in outline, elliptical behind, almost straight below, and flat enough to stand on its ventral face. Its antero-ventral margin is produced, prow-like; the sinus is broadly curved, but the beak has been much reduced by fracture in fig. 5 *a*. Rather above the middle of the posterior margin is the round spot, formed by a small indentation in the edge of each valve, with its central core of stone, and corresponding with the base of a hollow conical process, formed of two more or less terete and approximate spines, such as we see in several Cypridinads; for instance, *Philomedes interpuncta*. Edge-view pyriform; end-view suborbicular, with a tendency towards hexagonal.

Portions of the eroded shell remain on the dorsal and ventral regions (fig. 5 *a*), and we can see evidence of a small inturned flange on the ventral edges, with a minutely crenulate parallel edging or border (not clearly shown in the figures). There is also clearly discernible a low hump in each antero-dorsal region, affecting the end-profile of the carapace, and somewhat below it is a roughness at about the usual position of the muscle-spot.

This specimen has the same proportions as fig. 4; it is more rotund than fig. 21: excepting that its tubercle is not so strongly pronounced, and its posterior spine was higher up than in fig. 21, and lower than in fig. 4, we see no essential difference between them.

Fig. 4. Length $\frac{1}{4}$; height $\frac{1}{6}$; thickness $\frac{1}{6}$ inch. Proportions 11 : 8 : 8.

Fig. 5. „ $\frac{2}{7}$; „ $\frac{1}{4}$; „ $\frac{1}{4}$ „ 14 : 11 : 11.

Fig. 21. „ $\frac{1}{3}$; „ $\frac{2}{9}$; „ $\frac{1}{4}$ „ 17 : 10 $\frac{1}{2}$: 11.

The figured specimens of *Cypridellina Burrovii* are from the Lower Scar Limestone of Settle, Yorkshire; collected by Mr. J. H. Burrow, M.A., who has worked the district geologically with great success, and has favoured us with the use of his extensive collection. We have, therefore, adopted his name for this characteristic and wide-spread species.

2.* CYPRIDELLINA BURROVII, Var. *Longnoriensis*, nov. Plate III, fig. 8.

Carapace gibbose, suborbicular, varying in the curve of back and hind quarters; notched and produced in front with somewhat variable contours, fig. 8 being an average form. Tubercle small, low down, and forward; sometimes scarcely perceptible.

Length $\frac{1}{6}$; height $\frac{1}{7}$; thickness $\frac{1}{6}$ inch. Proportions 8 : 6 $\frac{1}{2}$: 5.

This small and weak *Cypridellina*, gregarious in the Derbyshire limestone, presents strong characters of alliance with the large *C. Burrovii* above described, and must be taken for a local variety of the species.

Accompanied by *Aviculopecten* and some small shells, it constitutes a mass of grey Carboniferous Limestone, from Longnor, Derbyshire: Tablet $\frac{3}{10}$ in the Museum of the Geological Survey, London (Geol. Survey Map, Sheet 81, S.E.).

3. CYPRIDELLINA INTERMEDIA. Sp. nov. Plate V, figs. 8 *a*, *b*, *c*.

This relatively small form seems at first sight to be the tubercled analogue of *Cypridinella superciliosa* (Pl. II, figs. 7 *a*, *b* *c*); it differs, however, from it in all its profiles, without reference to the local swelling or tubercle, being more elliptical in side-view and more compressed in edge-view. It much resembles *Cypridellina Burrovii* in side-view, but it is much thinner, and its tubercle is placed farther back.

Length $\frac{1}{8}$; height $\frac{1}{9}$; thickness $\frac{1}{16}$ inch. Proportions 6 : 5 : 3.

From the grey Carboniferous Limestone of Bathgate, Linlithgowshire. In Mr. W. Grossart's collection.

4. CYPRIDELLINA ELONGATA. Sp. nov. Plate III, figs. 18 *a*, *b*; 19 *a*, *b*.

Carapace elongate, suboviform, somewhat variable in outline; narrow-elliptical behind, bearing evidence of a posterior apex or spine. Notched in front, and sloping below the hood or beak into a prow, at an angle of about 60°. Tubercles strong, rather high up. Edge-view pyriform; end-view pentagonal.

Length $\frac{2}{7}$; height $\frac{1}{7}$; thickness $\frac{1}{5}$ inch. Proportions 13 : 7 : 9.

Several casts in the grey limestone of Visé have been kindly communicated to us by M. Bosquet, of Maestricht; some retain portions of shell (white), and we see the beak and tubercles more thoroughly expressed in the carapace than in the cast.

4.* CYPRIDELLINA ELONGATA, Var. *Hibernica*, nov. Plate III, figs. 9 *a—c*.

Smaller, feebler, less pronounced in thickness and tubercles, but not otherwise dissimilar, this must be taken for a local variety of the Belgian *C. elongata* above noticed.

Length $\frac{1}{5}$; height $\frac{1}{8}$; thickness $\frac{1}{9}$ inch. Proportions $9\frac{1}{2}$: 6 : $5\frac{1}{2}$.

This is an abundant and variable form, as shells and casts, in the Carboniferous Limestone of Little Island, Cork. The tubercle is in some high up, in others lower down and further back; occasionally it is very faintly expressed.

Collected by Mr. J. Wright, F.G.S., of Belfast.

5. *CYPRIDELLINA GALEA*. Sp. nov. Plate IV, figs. 3 *a—c*.

Carapace round-egg-shaped, very gibbose; apiculate and indented behind; strongly notched high up on the front, which slopes downwards and outwards, forming a strong prominent prow with the upward and outward curve of the antero-ventral margin. Edges of notch thickened. Tubercle large, just above the centre. Edge-view broad-ovate; end-view suborbicular, somewhat pentagonal.

Length $\frac{2}{7}$; height $\frac{5}{24}$; thickness $\frac{1}{4}$ inch. Proportions 13 : 10 : 12.

Cypridellina galea stands alone; distinct by shape, gape, and other features. The specimen is a shell in the Carboniferous Limestone of Little Island, Cork. Collected by Mr. J. Wright, F.G.S.

6. *CYPRIDELLINA VOMER*. Sp. nov. Plate III, figs. 7 *a—c*; 10 *a—c*.

6.* Var. *cultrata* (fig. 10).

6.* Var. *uncinata* (not figured).

Carapace-valves ovate-oblong, with suboval outline posteriorly; sloping, notched, and produced in front, with somewhat variable contours, either like a ploughshare with small notch (fig. 10 *a*, much resembling fig. 11), with a hatchet-like curve and large notch (var. *cultrata*, fig. 7 *a*), or curved still more suddenly downwards with a narrow, blunt, backward bending angle and a broad shallow sinus (var. *uncinata*, not figured).

The valves are rather compressed, with a variable convexity, and are faintly tubercled high up; the tubercle is almost obsolete in some more convex specimens. Edge-view of carapace long acute-ovate. End-view acute-oval.

Cypridellina vomer, fig. 10. Length $\frac{1}{5}$; height $\frac{1}{9}$; thickness $\frac{1}{12}$ inch. Prop. 9 : 5 : 4.

C. vomer, var. *cultrata*, fig. 7. „ $\frac{5}{24}$; „ $\frac{1}{7}$; „ $\frac{1}{12}$ „ „ 10 : 7 : 4.

C. vomer, var. *uncinata* (not fig.) „ $\frac{1}{5}$; „ $\frac{1}{8}$; „ $\frac{1}{8}$ „ „ 9 : 6 : 5.

The feebleness of the tubercle reminds us of a weak local elevation on the valves of *Cypridina Bradyana*, p. 15; but the shape of *Cypridellina vomer* is far more closely analogous to that of *Cypridinella vomer*, p. 25, without in any case being exactly the same. We have here rather the touchings of isomorphs than the coalescence of congeneric forms.

Cypridellina vomer, in its varieties, is common in the Carboniferous Limestone of Little Island, Cork, both as casts and shells, more or less weathered. Collected by Mr. Joseph Wright, F.G.S.

7. CYPRIDELLINA ALTA. Sp. nov. Plate III, figs. 15 *a*, *b*.

Carapace globose, ovate-triangular, short; rounded behind; truncate in front, with a long sloping broad face, sinuous in profile, impressed with deep transverse sinus and distinct beak, and angular below with an axe-like edge. The tubercle, not very strong, is high up and forward. The posterior curve is marked low down by the base of a hollow double spine.

Deep, short, and broad, this species has neither smooth *Cypridinella* nor furrowed *Cypridella* to match it.

Length $\frac{1}{8}$; height $\frac{1}{5}$; thickness $\frac{1}{7}$ inch. Proportions 8 : 9 : 7.

A grey shell, one of several, from Little Island, Cork, collected by Mr. J. Wright, F.G.S. Similar forms, as casts in white, yellowish, and grey Carboniferous Limestone from Visé, some with remnants of the shell, have been received from our friend, M. Bosquet, of Maestricht, For. Cor. Geol. Soc.

8. CYPRIDELLINA BOSQUETI. Sp. nov. Plate III, figs. 20 *a*, *b*.

This is a cast, imperfect at the notch and hood (not indicated in the sketch), of a *Cypridinella* with an extreme condition of the antero-ventral margin, which slopes downwards and *backwards* from the hood at an angle of 65°, to form a sharp, couler-like, vertical prow (too prominent in fig. 20 *b*); the ventral margin rises rapidly backwards from it, with an oval outline, to the narrow, rounded, posterior extremity, which was once probably spined. As the dorsal line is nearly straight, the side profile of the carapace is ovate-triangular. The tubercle is strong and rather forward.

Length $\frac{1}{4}$; height $\frac{1}{5}$; thickness $\frac{1}{6}$ inch. Proportions 12 : 9 : 8.

From the Upper Carboniferous Limestone, Visé, Belgium. We dedicate this well-featured species, with really large beak,¹ peculiar prow, and triangular outline, to M. J. Bosquet, For. Cor. Geol. Soc., one of the most earnest students of Belgian fossils, and to whom we are indebted for a large and choice collection of the fossil *Cypridinadæ* of Belgium.

¹ Broken in the specimen and not shown in the figure.

IV. CYPRIDELLA, *De Koninck*, 1844.CYPRIDINA, *De Koninck*, 1841, 1844.CYPRIDELLA, *De Koninck*, 1844.— *Jones and Kirkby*, 1863.

Carapace subovate, with either attenuate or subquadrate hind quarters; notched in front, with different degrees of beak or hood; tuberculate in various degrees, and impressed with a transverse dorsal sulcus behind the main pair of tubercles. Both the original subquadrate *Cypridella cruciata* of De Koninck, with one large tubercle on either valve, and his ovate *Cypridina Edwardsiana*, with more tubercles, are comprehended in this revised genus on account of intermediate alliances.

In the following arrangement of species we pass from the ovate to the subquadrate forms (Nos. 1—5), and then take a somewhat abnormal species that looks towards the next group (*Cyprellæ*).

Of these *Cypridella Koninckiana* and *C. obsoleta* are apiculate and indented behind; the others had posterior spines.

1. CYPRIDELLA EDWARDSIANA (*De Koninck*). Plate IV, figs. 4 *a—c*; Pl. V, figs. 11 *a—c*.

CYPRIDINA EDWARDSIANA, <i>De Kon.</i> , 1841.	Mém. Acad. Roy. Belg., vol. xiv, p. 17,
	fig. 9.
— — —	1843. In D'Omalus' Précis élém. Géol., p. 515.
— — —	1844. Descript. Anim. foss. Terr. Carb. Belgique, p. 287, pl. lii, fig. 2 <i>a—d</i> .
CY THERE	— <i>Dupont</i> , 1863. Bullet. Acad. Roy. Belg., sér. 2me, vol. xv, p. 110.
CYPRIDELLA	— <i>Jones and Kirkby</i> , 1864. Canad. N. Geol., June, 1864, p. 237; N. Jahrb., f. 1864, p. 54.

Carapace-valves gibbose, tuberculate; subovate in profile, nearly subtrigonal; acute behind, broad, and notched in front. Raised into a large subcentral tubercle (in the anterodorsal region), with two or more smaller knobs, above and below. Impressed with a dorsal or nuchal sulcus, passing from the back with an oblique curve across the centre, and dying out below.

The notch is obscure within the broad sinus of the front in the few specimens we

have seen. The antero-ventral margin rarely projects beyond the vertical line of the notch; it is sharper in our best specimen than in Prof. De Koninck's fig. 2 *c*, which has it rounded in a left valve placed with the anterior edge upwards; otherwise the outline agrees with that in our fig. 4 *a*. The main tubercle appears rather higher up in the Belgian figure than in ours; and the ventral tubercle is not so low down, nor so large, as in our figured specimen; indeed it seems to be linear and subdivided. The sulcus is not defined by Prof. De Koninck, and the edge-views of his specimen (fig. 2 *a*, ventral; 2 *b*, dorsal) indicate only a slight transverse depression.

Cypridella Edwardsiana has a profile much resembling that of *Cypridina Cummingii* (Pl. II, fig. 23); but it is sharper behind, less deeply notched in front, sometimes more produced antero-ventrally, and is not so convex, although tuberculate.

The small specimen of *Cypridella Edwardsiana*, var. *septentrionalis*, drawn in Pl. V, figs. 11 *a—d*, is from the grey Carboniferous Limestone of West Broadstone, Beith, Ayrshire; collected by Mr. John Young. It is relatively thicker and shorter, with a more angular edge-view, than figs. 4 *a—c*, Pl. IV. The "chin" is less developed; the dorsal tubercle is wanting, but the ventral swelling is considerable, and the central tubercle, quite as strong as in the Irish specimen, is truncate, as is that also; perhaps it was originally produced as a lateral spine or prickle. The posterior margin is acuminate. The worn surface shows numerous, minute, scattered pits, almost quincuncially arranged.

We have no doubt of the specific identity of the specimens alluded to. The differences can be only varietal at most. The features are more strongly expressed in the Irish and Scotch specimens than in the Belgian figured specimen; and the British form may be recorded as *Cypridella Edwardsiana*, Var. SEPTENTRIONALIS.

From Cork. Length $\frac{1}{4}$; height $\frac{1}{6}$; thickness $\frac{1}{7}$ inch. Proportions 11 : 8 : 7.

From West Broadstone. Length $\frac{1}{9}$; height $\frac{1}{12}$; thickness $\frac{1}{14}$ inch. Proportions 5 : 4 : $3\frac{1}{2}$.

The Belgian specimen is 5 millimètres in length. Proportions $9\frac{1}{2}$: 8 : $5\frac{1}{2}$.

The species is stated to be rare at Visé, Belgium. We have it from the Carboniferous Limestone of Cork, Ireland (Mr. J. Wright, F.G.S.), and of Bathgate and West Broadstone, Scotland (Mr. W. Grossart and Mr. J. Young), and at neither place is it common. The shell is preserved, but not perfectly, being minutely honeycombed by the action of water, giving rise sometimes to a deceptive appearance of granulations under the microscope.

2. *CYPRIDELLA KONINCKIANA*, Jones. Plate III, figs. 14 *a—c*; figs. 16 *a, b*; and figs. 17 *a—d*.

CYPRIDELLA KONINCKIANA, Jones, 1870. Month. Micr. Journ., vol. iv, p. 185, pl. lxi, fig. 9.

Carapace-valves ovato-triangular; convex; some with less vertical diameter than others, the ventral region being protruded into a blunt angle (fig. 14 *a*) in the latter. Dorsal line slightly convex, with a median depression, due to the nuchal furrow; posterior strongly apiculate and indented; anterior edge nasute, being deeply notched, produced above into a hook and almost vertical below, with a slight swelling or sigmoid curve not projecting out so far as the hood and beak. Tubercle usually strong, but variable; furrow distinct.

Fig. 16. Length $\frac{1}{4}$; height $\frac{1}{7}$; thickness $\frac{1}{9}$ inch. Proportions $11\frac{1}{2} : 7 : 5\frac{1}{2}$.

Fig. 17. „ $\frac{2}{7}$; „ $\frac{1}{6}$; „ $\frac{1}{7}$ „ „ $12\frac{1}{2} : 8\frac{1}{2} : 7$.

Fig. 14. „ $\frac{1}{4}$; „ $\frac{5}{24}$; „ $\frac{1}{6}$ „ „ $11\frac{1}{2} : 10 : 8$.

Figs. 17 *d, e* are three-quarter views of this species partly imbedded, to compare with Pl. IV, figs. 5, 6, 7, 8, which belong to different animals.

This is a well marked species, very common and well preserved in the Carboniferous Limestone of Little Island and the neighbourhood of Cork, Ireland. Collected by Mr. J. Wright, F.G.S., and dedicated to the veteran palæontologist of Belgium—Prof. Dr. L. de Koninck, of Liége, to whom we owe an early acquaintance with some of the most interesting of the fossil *Cypridinadæ*, and of the present genus in particular.

3. *CYPRIDELLA OBSOLETA*. Sp. nov. Plate III, figs. 12 *a—c*.

Carapace bean-shaped; ovate-oblong in side-view; apiculate behind at the middle; strongly notched and hooded in front. Tubercles and sulcus both faint, but much stronger on the left than on the right valve (figured).

Length $\frac{1}{5}$; height $\frac{1}{8}$; thickness $\frac{1}{9}$ inch. Proportions $9 : 6 : 5$.

The specimen, retaining a film of much-weathered shell, was collected by Mr. J. Wright, F.G.S., from the Carboniferous Limestone of Little Island, near Cork; and we know of none like it among our *Cypridinads*. The slight expression of its generic characters (tubercle and furrow) gives rise to its proposed name.

4. *CYPRIDELLA WRIGHTII*. Sp. nov. Plate IV, figs. 1 *a—c*.

Carapace oviform, but truncate and broadly notched anteriorly, and locally thickened by two very large hemispherical tubercles, one on either side of the antero-dorsal region. The rounded hinder end is marked by the circular base of a spinous apex.

Length $\frac{1}{8}$; height $\frac{1}{9}$; thickness $\frac{1}{8}$ inch. Proportions 11 : 8 : 9.

In this little dark-coloured shell from the limestone of Little Island, Cork (Mr. J. Wright), and in a white cast from Visé (Bosquet), we have a near approach to *Cypridella cruciata*, De Koninck ('Mém. Acad. Roy. Belg.,' vol. xiv, 1841, p. 20, fig. 11, and 'Descr. Crust. foss. Terr. Carb. Belg.,' 1844, p. 590, pl. 52, figs. 7 *a—e*) from Visé. Our specimens, however, are smaller, longer in proportion, more egg-shaped and tapering, have much larger tubercles, less hood, and more gape apparently, and have decidedly far less of the furrow across the back, which gives the cross-mark to Prof. De Koninck's species.

To the energy and discrimination of Mr. Joseph Wright, F.G.S., of Belfast, we owe the perfect specimen from Cork, and many other of the Entomostraca here described; and we record our appreciation of his love of geology and his scientific liberality by giving his name to this exquisite little fossil Cypridinad.

M. de Koninck's *C. cruciata* is represented (*loc. cit.*, fig. 7 *a*) by a right-hand valve, with its front face upwards; *b* is the anterior face, comparable with our fig. 1 *c*; the fig. 7 *d* shows the posterior extremity with the base of a spine, and *e* is the dorsal surface, cross-marked by the hinge-line and transverse furrow. It is a rare species. Length 4 millimètres. M. E. Dupont found it very rare in French Hainault, 'Bull. Acad. Belg.,' sér. 2, vol. xv, 1863, p. 110.

5. CYPRIDELLA QUADRATA. Sp. nov. Plate IV, figs. 2 *a, b, c*.

Carapace quadrate in each profile, bearing a very prominent, globose, nearly central tubercle on either side; the front strongly hooded, and projecting below in a coarsely trifold prow; somewhat convex on the back; almost straight and flat below; rounded behind, and bearing a mark of a spine at the postero-ventral angle; transverse sulcus (not shown in the figures) distinct on the back, and especially on the sides behind the tubercles. There is a trace of a muscle-spot below the tubercle and rather forwards.

C. quadrata. Length $\frac{1}{5}$; height $\frac{1}{7}$; thickness $\frac{1}{6}$ inch. Proportions 19 : 14 : 15.

C. Wrightii. „ $\frac{1}{6}$; „ $\frac{1}{9}$; „ $\frac{1}{8}$ „ „ 22 : 16 : 18.

C. cruciata. Length 4 millimètres. „ 18 : 18 : 20.

C. quadrata is longer and squarer than *Cypridella cruciata*, De Kon.; its tubercles are more free and globose; its hood and prow far more knobly, and its posterior spine was low down instead of being on the middle line.

Two strongly featured casts in the light-coloured Carboniferous Limestone of Visé, from M. Bosquet's collection, form the basis for the above specific determination.

6. *CYPRIDELLA CYPRELLOIDES*. Sp. nov. Plate IV, figs. 9 *a—c*.

Carapace-valve acute-ovate; pointed behind; indented in front with a shallow open sinus, leaving a blunt beak and retreating breast. Large, long, prominent tubercle, placed forwards and pointing backwards; and a strong sulcus behind it. Edge-view of carapace acute-irregular-oval; end-view rhombic.

This much resembles *Cyprella chrysalidea*, De Kon., in form; but it is quite smooth, having no annulation. It may be regarded either as a link or an isomorph. It is a light-grey shell from the Carboniferous Limestone of Cork, Ireland. Collected by Mr. J. Wright, F.G.S.

Length $\frac{1}{6}$; height $\frac{1}{9}$; thickness $\frac{1}{9}$ inch. Proportions 8 : 5 : 5.

V. *SULCUNA*. Gen. nov.

The carapace-valves are much like those of *Cypridella Wrightii* (Pl. IV, fig. 1) in lateral outline, being ovate-oblong, elliptical behind, and truncate and more or less indented, with sinus and notch, in front; but the nuchal sulcus is much more definitely and deeply marked. It passes obliquely downwards and forwards, undercutting the antero-dorsal region, and raising it into a slanting hump or even a backward-pointing process.

There is a tendency to point backwards in the subcentral tubercle of some *Cypridellæ*; and were the high position of the tubercle (as in Pl. IV, fig. 1) accompanied by a more backward development than even in Fig. 9, and associated with a strong and oblique furrow under the tubercle, we should have the main characters of our new genus.

1. *SULCUNA LEPUS*. Sp. nov. Plate IV, figs. 6 *a, b*; 7 *a, b, c*.

Valves ovate-oblong, truncate in front, rounded behind; antero-dorsal region formed into an oblique hump by the slanting nuchal furrow. Front margin indented; the sinus appears shallow in fig. 7 *a*, but deeper in fig. 6 *a*. The end-view of the carapace would present an acute-oval outline, with two suboval projections above.

Fig. 6. Length $\frac{1}{6}$; height $\frac{1}{9}$; thickness $\frac{1}{16}$. Proportions 8 : 5 : 3.

Fig. 7. „ $\frac{1}{4}$; „ $\frac{1}{6}$; „ $\frac{1}{9}$. „ 12 : 8 : 5.

Rare in the Carboniferous Limestone of Little Island, Cork. Mr. Joseph Wright, F.G.S.

2. *SULCUNA CUNICULUS*. Sp. nov. Plate IV, figs; 5 *a, b, c*; 8 *a, b, c*.

Smaller than *S. lepus*, and, in one specimen at least, more convex, strongly notched and hooded anteriorly (in a well-preserved specimen, fig. 8), and far more strongly indented by the dorsal furrow, whereby the antero-dorsal region of each valve is divided off as a pointed process, tending backwards and outwards. This curious species has a distant resemblance in outline to a couchant rabbit, with distinct pointed ears. In the end-view, fig. 8 *b*, these processes diverge more than in fig. 5 *b*. In fig. 5 *a* the anterior margin, its dorsal angle being obscured by matrix, is not perfectly shown, and a little tubercle, which is merely a local irregularity of the convex surface, is figured too strongly.

Fig. 5. Length $\frac{1}{5}$; height $\frac{1}{8}$; thickness $\frac{1}{16}$. Proportions 9:6:3.

Fig. 8. „ $\frac{5}{24}$; „ $\frac{1}{7}$; „ $\frac{1}{9}$. „ 10:7:5.

Mr. J. Wright, F.G.S., has found well-preserved but rather rare specimens in the Carboniferous Limestone of Little Island, Cork.

VI. CYPRELLA, *De Koninck*.

CYPRELLA et CYPRIDINA, *De Koninck*,¹ 1841, 1844.

CYPRELLA, *Dupont*, 1863.

— *Jones and Kirkby*, 1863.

The generic characters of this peculiar form are best understood from the description of the two species known to us. The general form is that of *Cypridinella* and *Cypridellina*, with apiculate and indented end and a truncate front; the latter notched, sloping downwards, and with either a nearly vertical or a receding antero-ventral margin. There are also present tubercle and dorsal sulcus, of varying intensities; but the chief character is a vertical and necessarily annular striation, furrowing, or step-like marking on the carapace. These parallel lines are more distinct, wider apart, and more step-like in *Cyprella chrysalidea* than in *C. annulata*. *C. chrysalidea* also has a more hood-like construction of the antero-dorsal region, over the sinus and notch, than either its fellow species, or any of the Cypridinads we know of. None of our figures, some of the best of our specimens being crushed casts, express quite so much as we can see in them; and M. De

¹ M. Cantraine, in reporting, together with M. Dumont, on Prof. De Koninck's "Memoir on the Carboniferous Crustacea of Belgium," in 'Bullet. Acad. Belg.,' viii, partie 1ère, p. 801 (1841), expressed the opinion that *Cyprella* might be *Cypridina*, and that *Cyprella chrysalidea*, De Kon., and *Cypridina annulata*, De Kon., might belong to one genus. In the latter opinion we fully coincide.

Koninck's somewhat exaggerated curve (in his fig. 6 *c*) is not without meaning in the representation of the curious Daphnioid hood, as shown also in his fig. 6 *a*. The structure of sinus and gape there clearly shown appears to be unique, and waits for elucidation.

1. CYPRELLA CHRYSALIDEA, *De Koninck*. Plate IV, figs. 10 *a—c*; 11 *a—c*; 14 *a, b*, 15, 16 *a—c*; 18 *a, b*. Including Var. *subannulata*.

- CYPRELLA CHRYSALIDEA, *De Koninck*, 1844. Mém. Acad. Roy. Belgique, vol. xiv, p. 19, fig. 7; 1843, in D'Omalius' Précis élém. Géol., p. 515; 1844, Desc. Anim. foss. Terr. Carb. Belg., p. 589, pl. lii, fig. 6 *a—e*.
- — — *Dupont*, 1863. Bull. Acad. Roy. Belg., sér. 2e, vol. xv, p. 110.
- — — *Jones and Kirkby*, 1864. N. Jahrb. f., 1864, p. 54; Can. Nat. Geol., June, 1864, p. 237.
- SUBANNULATA, *Jones*, 1870. M. Microsc. Journ., vol. iv, p. 185, pl. 61, fig. 10.

Carapace compressed-egg-shaped; subovate in outline, sharp behind; truncate and notched, or somewhat rounded and notched, in front; bearing subcentral tubercles of greater or less extent and elevation; surface marked with numerous vertically transverse, parallel striæ or furrows, or rather step-like graduated rings, like the body-rings of a chrysalis. These vary in number in our specimens; fig. 10 has only seven from behind up to the tubercle, and none beyond, over the anterior quarters of the shell; fig. 11 has ten or more on the posterior, and none on the anterior half of the shell; fig. 16 shows about fourteen over the whole length of the valve, and they are strongly marked as in fig. 10; fig. 18 also has about fourteen, as in fig. 16, whilst figs. 14 and 15 have about fifteen or sixteen; and the still more perfect Belgian specimen, figured by Prof. De Koninck, has eighteen or more clearly indicated from tail to hood.

The Belgian casts with which M. Bosquet has favoured us are sketched in figs. 14, 15, and 18, and though somewhat crushed and imperfect, they show the general features clearly enough [fig. 18 *a* ought to indicate a trace of the tubercle]. Like them, though not quite so large, is a well-preserved grey shell (fig. 16) in grey limestone from Settle, Yorkshire (Mr. J. H. Burrow), fully satisfying palæontologists of the existence of the Belgian species in the British area during the Lower Carboniferous Period. It has a rounded hood, low-set notch, and feeble tubercle, but we hesitate to regard these differences as of specific value.

In fig. 10 we exhibit another but smaller specimen; a grey shell, in grey limestone, from Settle (Mr. Burrow). It is like the others, except that the beak is relatively stronger

in profile, the breast more retreating, and the rings fewer in number, and investing only the hinder half of the valve. This is our Var. SUBANNULATA (*C. subannulata*, Jones, 1870).

In fig. 11 we see a similar shell, dark grey, from Little Island, Cork (Mr. J. Wright, F.G.S.), rather more convex than the last, with a somewhat stronger tubercle, and marked by a few more rings on its posterior moiety. This has the definitely apiculate and indented posterior margin that we see in M. De Koninck's fig. 6 *c*.

Fig. 16 and fig. 10 agree in the symmetrically elliptical shape of the hinder extremity, whilst fig. 11 is indented and apiculate posteriorly, like De Koninck's original specimen (his fig. 6 *c*); but figs. 11 and 10 agree as to the form of the beak or hood, and fig. 16 differs in that point from all. So also figs. 10 and 16 agree as to general convexity with each other, and with all the Belgian specimens, and their tubercles are low; whilst fig. 11 has an unusual convexity of the hinder half, and its tubercle also is strong. We see an extra large tubercle in fig. 15, but this cast (Belgian) is not well preserved; and the tubercle is very feeble in fig. 18, also a Belgian cast (compressed).

Looking at all the slight differences above detailed, and weighing them against the features of mutual resemblance, we must still regard all these specimens as belonging to one species; suggesting, however, that fig. 10 (from Settle) and fig. 11 (Cork) are varietal (Var. *subannulata*), if not male or young specimens, and that possibly fig. 16 may also be a local variety.

	Length.	Height.	Thickness.	Proportions.		
				Length.	Height.	Thickness.
De Koninck's figs. 6 <i>a—e</i> . . .	$\frac{11}{24}$	$\frac{1}{4}$	$\frac{1}{6}$ inch.	11	6	4.
Fig. 10, from Settle (Var.) . . .	$\frac{5}{24}$	$\frac{1}{8}$	$\frac{1}{9}$	10	6	5.
Fig. 11, from Cork (Var.) . . .	$\frac{1}{4}$	$\frac{1}{7}$	$\frac{1}{8}$	11	7	6.
Fig. 14, poor cast, Belgium . . .	$\frac{2}{7}$	$\frac{1}{6}$	$\frac{1}{7}$	14	8	7.
Fig. 16, from Settle . . .	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{9}$	12	8	5.
Fig. 18, compressed cast, ¹ Belgium	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{9}$	15	$9\frac{1}{2}$	5.

Cyprella chrysalidea is represented in Prof. De Koninck's plate 52 by the right valve (fig. 6 *c*) with its front upwards, by the dorsal (*e*) and ventral (*a*) views of the carapace, and by two views of natural size (*b* and *d*). It appears to us that the artist made too strong a line and too free a curve between the hood and the tubercle, as also in fig. 7 *a* of the same plate. The curve in fig. 3 we interpret somewhat differently. See further on, p. 40.

C. chrysalidea is stated by De Koninck to be ten millimètres in length, and to be very rare at Visé; so also M. E. Dupont refers to it as being very rare in French Hainault ('Bull. Acad. Belg.,' sér. 2e, vol. xv, p. 110). M. Bosquet has kindly sent us some Belgian casts of this interesting little fossil.

¹ This has been somewhat compressed; hence a greater height and less thickness, perhaps, than in the original carapace.

It is not common either at Little Island or Settle, whence Messrs. Wright and Burrow obtained their specimens respectively. The late Rev. J. G. Cumming found it in the Poolvash Limestone, Isle of Man, and presented a specimen to the Geol. Mus. Survey, London, Tablet $\frac{3}{1}^8$. Another specimen on the same Tablet came from Longnor, Derbyshire. We have also seen a specimen in the Carboniferous Limestone of Bathgate, Linlithgowshire, collected by Mr. Grossart, Surgeon, of Salsburg, Lanarkshire.

2. *CYPRELLA ANNULATA* (*De Koninck*). Plate IV, figs. 12 *a, b*; 13 *a, b*; 17 *a, b, c*.

- CYPRIDINA ANNULATA*, *De Koninck*, 1841. Mém. Acad. Roy. Belg., vol. xiv., p. 18, fig. 8; 1843, in D'Omalus' Précis élém. Géol., p. 515; 1844, Desc. Anim. foss. Terr. Carbonif. Belg., p. 588, pl. lii, figs. 3 *a, b*.
- CYTHERE* — *Dupont*, 1863. Bullet. Acad. Roy. Belg., sér. 2e, vol. xv, p. 110.
- CYPRELLA* — *Jones and Kirkby*, 1864. N. Jahrb. f., 1864, p. 54; *Canad. Nat. Geol.*, June, 1864, p. 237.

Carapace short oviform, truncate and notched in front; bluntly apiculate and indented behind; the subcentral tubercle large; the nuchal furrow variable, stronger in some individuals than in others; vertical across the valve in fig. 12 *a*; strongest behind and below the tubercle in fig. 13 *a*; merely intensifying the back of the tubercle in fig. 17 *a*; deeply notching the back in Prof. De Koninck's figured specimen. Surface vertically scored throughout, with about eighteen parallel, sometimes sinuous, lines, with weaker and partial lines between; and in one interesting case we find a distinct reticulate ornament of minute, polygonal, raised meshes on the shell, traversed by the small parallel furrows above mentioned (fig. 12 *b*, magnified twenty diameters).

	Length.	Height.	Thickness.	Proportions.		
				Length.	Height.	Thickness.
<i>C. annulata</i> (De Kon.), plate 52, fig. 3 <i>a, b</i> (about seven millimètres long) . . .	$\frac{1}{3}$	$\frac{1}{4}$?	12	9	?
Fig. 13, from Settle . . .	$\frac{1}{4}$	$\frac{5}{24}$	$\frac{1}{4}$	12	10	11.
Fig. 17, from Cork . . .	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{5}$	12	$8\frac{1}{2}$	9.

Prof. De Koninck has figured a left valve (fig. 3 *a, b*), comparable with our fig. 13 *a*, with its front upwards; and the artist has introduced an artificial curve, involving the antero-dorsal region and the tubercle, and following the line of the strong nuchal furrow, where it has depressed the dorsal edge. The front margin (upwards) is imperfect, and therefore rounded, as in our fig. 12 *a*. The convex ventral margin (on the left hand of

the reader), and the apiculate and indented hinder margin (downwards in fig. 3 *a*, *b*), are very characteristic.

Fig. 12 is a grey valve (showing reticulate sculpture under the microscope, 12 *b*) in grey limestone from Cork (Mr. J. Wright, F.G.S.). It seems to be rounded in front, but is really imbedded in the matrix; it has a low tubercle, and a strong, broad, transverse furrow across the surface, the hinder moiety of the valve being very convex.

Fig. 13 is a larger valve, grey, with a suborbicular outline; from the grey limestone of Settle; collected by Mr. J. H. Burrow, M.A., who has enriched our list with many Carboniferous species.

Fig. 17, a grey shell in grey limestone, is more ovate than either of the foregoing, being narrower in vertical diameter; perhaps a male. It was collected, with a few others, at Little Island, Cork, by Mr. J. Wright, F.G.S., who has been so successful in his search in the Carboniferous Limestone of Cork, Ireland.

We have also seen a specimen of this species in Mr. W. Grossart's collection from the Carboniferous Limestone of Bathgate, Linlithgowshire.

Our specimens are much less depressed at the nuchal furrow than Prof. De Koninck's original seems to have been; but evidently that is a variable feature.

Cyprella annulata is said to be very rare at Visé, Belgium (De Koninck), and in French Hainault (Dupont).

We now return to some forms closely related to *Cypridina*, and well known in the recent state, namely, *Bradycinetus* and *Philomedes*. Of the former we have certainly a good representative in the Carboniferous Formation at Carlisle, Scotland; of the latter a less decided, but very probable, representative has been sent to us from the Carboniferous Limestone of Cork, Ireland. After having treated of some other fossil forms, which, however, have no closely allied existing representative, but are evidently Cypridinads (*Entomoconchus* and *Offa*), we shall treat of some fossil forms of *Polycope* and *Cytherella*, and then take up some extinct Entomostraca (*Entomis*), whose relationship with the Ostracoda is obscure, and in which the absence of the anterior notch and the presence of a strong nuchal furrow are distinguishing features.

VII. BRADYCINETUS, *G. O. Sars.*CYPRIDINA, *Baird*, 1850.— *Liljeborg*, 1853.ASTEROPE, *Fischer*, 1854.CYPRIDINA, *Stimpson*, 1854.BRADYCINETUS, *G. O. Sars*, 1865.— *G. S. Brady*, 1867, 1868, 1871.

Carapace strong, ovato-globose; deeply notched; edge of the beak sinuous, or even produced into small horn-like processes. See page 9.

1. BRADYCINETUS RANKINIANUS, *J. and K.* Plate II, figs. 21, 22 *a—c*. Plate V, fig. 5.

CYPRIDINA RANKINIANA, *J. and K.*, 1867. *Trans. Geol. Soc. Glasgow*, vol. ii, p. 218; and vol. iii, Suppl., 1871, p. 27.

Carapace globose; compressed anteriorly, round-oval or broad-ovate in outline; deeply notched in front, beneath a broad beak, which has a jagged or sinuous edge (fig. 5, Pl. V).

The surface is smooth and finely reticulate (fig. 22, *c*), with irregularly quadrangular meshes, slightly sunken at the centre. The Muscle-spot, distinct on the cast (fig 21), is almost central.

Two specimens of this interesting species occur in the half of a small round ironstone nodule from Gare, Carluke: from the same stratum that yielded the Coprolite with *Polycope simplex* (p. 53), equivalent to the "First Calmy Limestone of Braidwood," 340 fathoms below the Ell Coal. In Dr. Rankin's Collection.

The nodule is seven eighths of an inch in greatest diameter; beneath its external coat (one sixth of an inch) is a thin layer of calc-spar, next a film of ironstone, and the inside consists of a blue argillaceous septarium, one fissure of which passes through one of the specimens.

Bradycinetus Rankinianus is like *B. Macandrei* (Baird), Brady, 'Trans. Lin. Soc.,' vol. xxvi, plate 37, figs. 14—17, in general aspect, but is more gibbose and more oval in outline; but it is not truncate behind, nor is there evidence of its having been spined at the postero-ventral region. It has a notch and beak closely resembling those of *B. Macandrei*; and, though *B. Brenda* has a somewhat different structure of these parts we refer our fossil to this genus, guided by the peculiarity of beak, general contour, and ornament. It is dedicated to the indefatigable explorer of Carluke fossils, Dr. D. R. Rankin, who has aided us kindly with many specimens.

Length $\frac{1}{4}$; height $\frac{1}{5}$; thickness $\frac{1}{8}$ inch. Proportions 12 : 9 : 6.

VIII. PHILOMEDES, *Lilljeborg*.

? CYPRIS, *Nicolet*, 1849.

CYPRIDINA, *Baird*, 1850.

PHILOMEDES, *Lilljeborg*, 1853.

CYPRIDINA, *Dana*, 1855.

PHILOMEDES, *Norman*, 1861.

— *G. O. Sars*, 1865.

— *G. S. Brady*, 1867, 1868, 1871.

Carapace subcylindrical ♂, or ovate ♀; frequently spined or apiculate posteriorly; notch deep and large. One known form (*Ph. Folinii*, Brady) has a coarsely ridged and deeply pitted carapace. See page 8.

1. PHILOMEDES BAIRDIANA. Sp. nov. Plate II, figs. 30, 31 *a, b, c*.

Carapace-valves suboblong, compressed; excised by a broad antero-inferior sinus; and impressed by a medio-dorsal furrow. Edge-view of carapace narrow-oblong, with elliptical ends; end-view obovate.

This resembles some published figures of *Philomedes interpuncta* ♂; but the specimens, not being free of the matrix, are apparently without the usual posterior spine or process; the notch, also, is too broadly rounded, though the gape is smaller; and the nuchal furrow is rather too strong for *Ph. interpuncta*.

Length $\frac{5}{24}$; height $\frac{1}{9}$; thickness $\frac{1}{14}$ inch. Proportions 10 : 5 : $3\frac{1}{2}$.

We dedicate this interesting Cypridinad to the memory of our deceased friend Dr. W. Baird, by whom the knowledge of Entomostraca was so greatly advanced.

Ph. Bairdiana occurs as grey shells (two) in the grey Carboniferous Limestone of Little Island, Cork. Collected by Mr. Joseph Wright, F.G.S.

IX. RHOMBINA. Gen. nov.

Belonging possibly to the *Cypridinadæ*, but differing in shape from any of the foregoing genera, there are some rare specimens of carapace-valves obliquely oblong or rhomboidal in profile, and rather compressed, which have a slight sinus and a mere trace of

the Cypridinal notch on the sloping anterior margin under the projecting antero-dorsal angle. The nearest approach to this structure among the species described in the previous pages is seen in figs. 15—19, Pl. II, *Cypridina brevimentum*, and in figs. 30 and 31, Pl. II, which we have doubtfully referred to *Philomedes* (p. 43). In both cases, however, a large sinus and definite notch give a considerable gape to the closed valves. In *Polycope*, which is known to differ considerably from *Cypridina* in its organs, the sinus is reduced to a minimum, and the notch is quite wanting, so that there is no gape at all. The above-mentioned specimens, having still some amount of sinus, notch, and gape, differ essentially from *Polycope*; and they differ in degree, to a large extent, from the above quoted Cypridinads. And as the features here referred to were doubtless in strict relation with the capability and appliance of the internal organs and the extruded swimming feet, we propose to group these few specimens under a new genus, RHOMBINA. A marginal rim on the ventral edge of the valves may also be mentioned as a noticeable feature, on account of its much greater development than in any other of the allied forms.

There is some resemblance between *Rhombina* and certain forms of *Aristozoe*, one of M. Barrande's Silurian genera from Bohemia, but the latter has usually antero-dorsal tubercles and sometimes a nuchal sulcus.

1. RHOMBINA HIBERNICA. Sp. nov. Plate II, figs. 32 *a—c*; Plate V, figs. 13 *a—c*.

Carapace subcylindrical, with slanting ends; somewhat pod-shaped; compressed anteriorly. Carapace-valve almost a rhomb in outline, obliquely truncate at both extremities, with nearly parallel lines, but more acutely (60°) at the anterior end than at the other (70°). The most prominent angle is at the antero-dorsal region, under which a slight sinus notches each valve, making a small gape.

The dorsal line is straight; the lower margin is slightly convex, and is bordered by a distinct raised rim. End-view of the carapace is acute-oval; edge-view long compressed ovate.

Length $\frac{1}{4}$; height $\frac{1}{8}$; thickness $\frac{1}{9}$ inch. Proportions 12 : 6 : 5.

This species is represented by a well-preserved dark-coloured shell from the Carboniferous Limestone of Little Island, Cork, and was brought to our notice by its discoverer, Mr. J. Wright, F.G.S.

[The figure 32 *a*, in Pl. II, represents the valve upside down; it is therefore refigured in Pl. V, fig. 13 *a*.]

2. RHOMBINA BELGICA. Sp. nov. Plate V, figs. 14 *a—d*.

Carapace oblong-ovate, subcylindrical, truncated obliquely at the extremities, and some-

what compressed posteriorly. Anterior slope 70° ; hinder slope 80° . Dorsal and ventral margins slightly convex, the latter bordered by a raised rim. End-view acute-oval; edge-view long-pyriform.

Length $\frac{14}{8}$; height $\frac{7}{8}$; thickness $\frac{6}{8}$ inch. Proportions 14 : 7 : 6.

This rare form occurs to us as a single valve from the Upper Carboniferous Limestone at Visé, Belgium, and we are indebted to M. J. Bosquet, F.C.G.S., for this and other interesting specimens.

X. ENTOMOCONCHUS, M^cCoy, 1839.

The bibliographical history of *Entomoconchus* is that of its best-known species, *E. Scouleri*. In 1839 Professor F. M^cCoy figured and described as *Entomoconchus Scouleri*, in the 'Journal of the Geological Society of Dublin' (vol. ii, p. 91, pl. 5, figs. a—e), some large globose Entomostracan specimens which had been obtained by himself and Dr. Scouler from the Mountain-limestone of Clane, Co. Kildare, Ireland. This form had already been recognised as occurring in the Mountain-limestone of Bolland (Bowland Forest), Yorkshire, by Prof. John Phillips, and was referred to by him in his 'Geology of the Mountain-limestone District of Yorkshire' (1836), pages 240 and 251, as a "Cypridiform Shell," in the Gilbertson Collection;¹ but he did not describe it, though he gave sketches of it in pl. 22, figs. 23 and 24, of that work.

In 1841 five species of Bivalved Entomostraca from the Carboniferous Limestone of Belgium were figured and described by Prof. Dr. L. De Koninck, of Liége, in his 'Mémoire sur les Crustacés fossiles de Belgique,' in the 'Mémoires Acad. Royale Belg.,' vol. xiv. At page 16, under the name *Cytherina Phillipsiana* (fig. 13), we have the peculiar gibbose form common in some of the beds of the European Mountain-limestone, and above referred to as *Entomoconchus Scouleri*. The foregoing five species, together with one other, were more fully treated and illustrated in his 'Description des Animaux fossiles qui se trouvent dans le Terrain Carbonifère de Belgique' (4to, Liége, 1842–44). Among them De Koninck described his *Cypridina Edwardsiana*, *C. concentrica*, *C. annulata*, *Cyprella chrysalidea*, and *Cypridella cruciata*. The generic affinities, however, were not well determined, owing to the fact of the peculiar antero-ventral notch in the valves of *Cypridina* having been omitted in the engraving of Milne-Edwards's typical species (as explained in the 'Monograph of Tertiary Entomostraca of England,' Pal. Soc., 1856, page 9), and the palæontologist having been thereby misled in collocating the fossil carapaces with their recent analogues. See above, p. 11.

In 1844 Prof. M^cCoy enlarged our knowledge of the Entomostraca of the

¹ Now in the British Museum.

Carboniferous rocks by the description and illustration of twenty-two forms (including *Entomoconchus Scouleri*) from the Lower Carboniferous strata of Ireland, in his 'Synopsis of the Characters of the Carboniferous Fossils of Ireland' (4to, Dublin, 1844). Having been enabled, through the courtesy of Sir Richard Griffith, Bart., to examine the original specimens, we communicated to the 'Annals Nat. Hist.' for July, 1866, a critical notice of the whole, and arrived at the following conclusions as to the specimens of *E. Scouleri*:¹

"1. *Entomoconchus Scouleri*. Lower Carboniferous Limestone; Little Island, Cork. 'Synops. Carb. Foss. Ireland,' p. 164. Griffith, "List of Localities" ('Journ. Geol. Soc. Dublin,' vol. ix), p. 68. A weathered shell [not "cast"] in grey crystalline fossiliferous limestone.

"1*. Another shell, in similar limestone; Millicent, Clane, Co. Kildare.

"1**. Another specimen (labelled '*E. Scouleri*, Upper Carboniferous Limestone; Black Lion, Enniskillen, Co. Leitrim,' 'Localities,' p. 80) is a dark-coloured crystalline shelly limestone with a *Cyclus*."²

In Prof. M'Coy's figures and descriptions of *E. Scouleri* the hinge-line is by mistake referred to the anterior extremity, and the relations of the other margins are consequently misconstrued. His figures published in 1839 are large and carefully drawn, but those of 1844, also those by Phillips and De Koninck, are not of sufficient size, nor exact enough, to serve the purposes of the naturalist.

The characteristic feature in *Entomoconchus*, namely, the anterior peak, with a fissure beneath, formed by a sudden, though slight, inward curve of the edge of each valve, just below the antero-dorsal region, and analogous to the Cypridinal beak and notch, was not noticed until 1863, when we pointed out that *Entomoconchus* is one of the *Cypridinadæ* in a provisional notice of the Entomostraca of the Carboniferous Period read before the British Association.³

Generic Description.—The carapace of *Entomoconchus* is bivalved and subglobose; valves subequal, smooth, thick ($\frac{1}{30}$ th inch and more). In some instances, where large individuals are crowded together (Kildare and Bolland), the middle portions of some valves appear to be $\frac{1}{16}$ th inch thick, but this may, possibly be due to the close approximation of valve within valve. Sometimes a very faint reticulate structure is recognisable in well-preserved shells. The left valve strongly overlaps the right valve in the antero-dorsal region, less so postally, and slightly at the ventral border. This kind of overlap exists in two of Dr. Baird's *Cypridinæ*, *C. Zelandica* and *C. albomaculata* ('Proc. Zool. Soc.,'

¹ See 'Annals Nat. Hist.,' ser. 3, vol. xviii, p. 41.

² For a full account of all that is known of this curious little fossil Crustacean and its allies see Mr. Henry Woodward's exhaustive memoir in the 'Geol. Mag.,' 1870, vol. vii, pp. 554—560, pl. 23.

³ See 'Report Brit. Assoc.,' Newcastle-on-Tyne, for 1863, Trans. Sect., p. 80; also 'Canadian Naturalist and Geologist,' new ser., vol. i, 1864, p. 236; 'Neues Jahrbuch für Min. Geol.,' &c., 1864, p. 54; and 'Geologist,' vol. vi, p. 460, 1863.

“Annulosa.”) The hinge-line is simple, the thin edge of the right valve being received under the overlap of the opposite valve.

The posterior portion of the carapace is rounded, the curve varying with individuals. The anterior is truncate, usually obliquely, and with a more or less sinuous outline, due to a depression accompanying the slight notch that is cut out (or rather indented) below the well-marked antero-dorsal angle. These correspond with the hood and notch of most of the *Cypridinadae*.¹ The gape or opening at the notch is narrow and vertical (not transverse, as in *Cypridina* and many of its allies). It is widest above, and closes at about the middle of the vertical line, but reopens, with a smaller vertical fissure, at the antero-ventral angle of the carapace, which is rounded and subcarinate, being impressed on either side by a marginal furrow continued downwards from the depressed area. In old individuals a short oblique furrow passes off on each side from the great sinus or depressed area of the front of the carapace; it is directed backwards and downwards, from below the hood-like notch, and above the antero-ventral dehiscence of the valves. There is also a small round or oval space left between the valves, sometimes accompanied by a slight prominence at the postero-ventral angle, or at the corresponding curve. This probably had relation to a marginal spike on each valve, such as is met with in many bivalved Entomostraca. Near the middle of the inside of each valve, but rather nearer the antero-ventral angle, a relatively large “Muscle-spot” is strongly marked in old individuals of *E. Scouleri* by a suboval patch of short radiating furrows within a much larger sunken circular area.

A local cloudiness of discoloration only is sometimes seen at this point on the outside of the perfect valves, but by the loss of the exterior coating, from solution of the carbonate of lime (a result of weathering), the radiate lines of the Muscle-mark are frequently brought to view. These vascular rays of the Muscle-spot are transverse in the middle, longitudinal at the extremities above and below, and at graduated angles between on either side.²

The Muscle-spot was distinctly indicated by Prof. M'Coy in 1839. Somewhat similar radiating groups of linear “lucid spots” are observable in several published figures of *Cypridinae* (Baird and others).

A difference of outline and of the number of radiating canals occurs in the figured Muscle-spots of our specimens (figs. 3 *d*, 4 *d*, 5 *d*); but we do not see how to assign these differences as characters of sex, age, or variety. Fig. 3 *d*, showing the coarsest radii, is a perfect cast of the Muscle-spot; the others are seen by partial loss of the outer crust of the valve.

¹ *Cypridina*, *Philomedes*, *Asterope* and *Bradycinetus* possess the anterior or antero-ventral notch *Eurypylus* and *Heterodesmus* have it far less developed or barely present. *Polycope*, a member of an allied group, has no notch. See above, pages 3 *et seq.*

² A curiously similar pattern is seen on the dorsum of *Cryptonota citrina*, Stimpson, ‘Invertebr. Grand Manon,’ p. 36, pl. 2, fig. 27.

Relationship of the Genus.—The carapace of *Entomoconchus* differs from that of any of the known species of *Cypridina*, *Philomedes*, *Asterope*, or *Bradycinetus*, in its sub-quadrilateral outline, the hood and notch being only slightly developed, and usually much higher up than in the oval *Cypridinadæ*. Its greater globosity and the thickness of its valves distinguish it from the majority of the Cypridinal species, though the overlap of the larger (left) valve is the same as in *Cypridina? Zelandica*, Baird ('Proc. Zool. Soc.,' Annulosa, pl. 17, figs. 11—13), and *C.? albomaculata*, Baird (ibid., pl. 71, figs. 1 *a—d*). The Muscle-spot of the latter has a somewhat similar character to that of *Entomoconchus*.

There is a superficial likeness between some of the smaller specimens of *Entomoconchus* and the carapace of *Limnetis Gouldii*, Baird ('Proceed. Zool. Soc.,' 1862, p. 149, Annulosa, pl. 15, fig. 7); but the Cypridinal notch is absent in the latter, and the Muscle-spot is very different.

Figs. 1 and 7 of our Plate I have outlines somewhat similar to that of *Polycope orbicularis*, Brady ('Lin. Soc. Trans.,' vol. xxvi, pl. 35, fig. 53); but with this the resemblance ends, for in *Polycope* the Cypridinal notch is quite obsolete.

With the similarly globose, but strongly hinged, *Heterodesmus*,¹ an imperfectly known Cypridinal from the Sea of Japan, *Entomoconchus* has shape and gibbosity in common, but the hingements differ, as well as the form and amount of notch or sinus.

Judging by the carapace-valves, all of the animal that remains to us, *Entomoconchus* was a marine gregarious Bivalved Entomostracan (as indicated by M'Coy in 1839), closely allied to the existing *Cypridinadæ*; but the high position and the feeble development of its "notch" and "hood," and the vertical, narrow, interrupted anterior "gape" of the valves, are distinctive features, connected with the extrusion of the antennæ (swimming limbs) and other organs, which were doubtlessly planned somewhat differently to those of the existing genera.

For the better understanding of the illustrations referred to we note that—

In Prof. M'Coy's figures (1839)—

Fig. *a* is the anterior aspect of a carapace, the dorsal border being to the right hand of the reader, and the right valve upwards. Compare our Pl. I, fig. 2 *d*, &c.

Fig. *b* is the ventral aspect, with the anterior end upward. Compare our fig. 6 *c*, &c.

Fig. *c* is the side view of a carapace, showing the right valve and its muscle-spot; the anterior end is upwards, and the dorsal border to the left of the reader. Compare our fig. 4 *a*, &c.

Fig. *d* (natural size) is an outline view of the last-mentioned aspect (or of a left

¹ G. S. Brady, 'Trans. Zool. Soc.,' 1866, vol. v, p. 387, pl. 72, figs. *a—h*.

valve); the dorsal border is to the left of the reader, and the front end upwards.

Fig. *e* is a diagrammatic plan of the rays of the Muscle-spot. Compare our figs. 3 *d* and 4 *d*.

In Prof. M'Coy's figures (1844)—

Fig. 4 *a*, carapace showing right valve; anterior upwards.

Fig. 4 *b*, ventral aspect.

In Prof. Phillips's figures (1836)—

Fig. 23, carapace, side-view, showing left valve; anterior end upwards.

Fig. 24, carapace, ventral view; anterior upwards.

In Prof. De Koninck's figures (1841, 1844)—

Fig. 1 *a*, side-view of carapace, showing the left valve; anterior end upwards.

Fig. 1 *b*, ventral aspect of carapace; anterior upwards.

1. ENTOMOCONCHUS SCOULERI, *M'Coy*. Plate I, figs. 1—6. Var. OVALIS, fig. 1.

"Cypridiform Shell," *J. Phillips*, 1836. *Illust. Geol. Yorkshire*, part. 2, p. 240 and p. 251, pl. xxii, figs. 23, 24.

ENTOMOCONCHUS SCOULERI, *M'Coy*, 1839. *Journ. Geol. Soc. Dublin*, vol. ii, p. 91, pl. v, figs. *a—e*.

CYTHERINA PHILLIPSIANA, *De Koninck*, 1841. *Mém. Acad. Roy. Belgique*, vol. xiv, p. 16, fig. 13; 1843, in *D'Omalius's Précis élém. Géol.*, p. 515.

— — — *Morris*, 1843. *Catal. Brit. Foss.*, p. 73.

— — — *De Koninck*, 1844. *Descript. Anim. foss. Terr. Carb. Belg.*, p. 585, pl. lii, fig. 1 *a, b*.

ENTOMOCONCHUS SCOULERI, *M'Coy*, 1844. *Synops. Char. Carb. Foss. Ireland*, p. 164, pl. xxiii, fig. 4.

CYTHERINA PHILLIPSIANA, *Cumming*, 1846. *Quart. Journ. Geol. Soc.*, vol. ii, p. 322.

CYTHERE — — — 1848. *The Isle of Man*, Appendix Q, p. 355.

ENTOMOCONCHUS SCOULERI, *Morris*, 1854. *Catal. Brit. Foss.*, 2nd edit., p. 108.

CYTHERE PHILLIPSIANA, *Dupont*, 1863. *Bull. Acad. Roy. Belg.*, ser. 2, vol. xv, p. 110.

ENTOMOCONCHUS SCOULERI, *Jones & Kirkby*,¹ 1863. *Geologist*, vol. vi, p. 460; 1864, *Rep. Brit. Assoc. for 1863, Trans. Sect.*, p. 80; *Neues Jahrb.*, 1864, p. 54; *Canad. Nat. Geol.*, 1864, new ser., vol. i, p. 236; 1866, *Ann. Nat. Hist.*, ser. 3, vol. xviii, pp. 41, 46, 48.

¹ The references in 'Trans. Geol. Soc. Glasgow,' 1867, vol. ii, p. 218, and 'Trans. Geol. Soc. Glasgow,' vol. iii, Supplement (Young and Armstrong's 'Carb. Foss. W. Scotland,' 1871), p. 28, were by our mistake made to specimens of *Cypridina Phillipsiana*.

ENTOMOCONCHUS SCOULERI, *Jones*, 1870. *Monthly Microsc. Journ.*, vol. iv, p. 185, pl. lxi, fig. 17.

Carapace subglobose, with a subquadrilateral profile; more strongly arched on the dorsal than on the ventral border; truncate in front, with slight notch, depressed area, and narrow interrupted gape, as described above (p. 46).

Individuals differ one from another in the profiles of their several aspects, as side-view, end-view, and edge-view, and when some agree in one profile they differ in others. Some (as figs. 2, 3, and 5), which are fuller in the postero-dorsal region than others (figs. 4 and 6), may have been females.

The diversity of outlines leads us to treat of the selected specimens separately, thus:

Pl. I, figs. 1 *a—c*.—The cast of a varietal form, and probably a small male, from the Carboniferous Limestone of Clonalvy, near Naul, Co. Meath, Ireland.¹ It is $\frac{7}{24}$ ths of an inch long. Side-view obliquely ovate; truncated obliquely in front, having its longest diameter from the antero-dorsal angle to the postero-ventral curve. End-view ovate, broadest downwards. Edge-view long-ovate, broadest anteriorly. The transverse (through the valves), vertical, and longitudinal diameters are as 5 : 6 : 7.

This specimen indicates a carapace proportionately longer, more convex below, and more depressed in the postero-dorsal region (the last being probably a masculine feature), than the other oblique-ovate specimens (figs. 4 and 6), and it differs also from them somewhat in the profiles both of end and edge. Hence we regard it as a variety—*Var. OVALIS*.

Figs. 2 *a—d*.—This is a yellowish-grey shell of probably a young female *E. Scouleri*, one third of an inch long. It is from the Lower Scar Limestone of Settle, Yorkshire (Mr. J. H. Burrow, M.A.). Side-view subquadrate, with the postero-ventral region rather prominent and the dorsal wall rounded. End-view ovate, broadest below. Edge-view long-ovate, broadest in front.

The diameters have the following proportions:—Transverse (thickness of the whole carapace) as 8; vertical as 11; longitudinal as 13.

We have the same form from the Carboniferous Limestone of Bolland,² Yorkshire (Prof. Morris, F.G.S.), and of Visé, Belgium (M. Bosquet, C.M.G.S.).

Figs. 3 *a—d*.—This is a rather large specimen, consisting of a light-grey limestone cast and a piece of cream-coloured shell, from Visé, Belgium; the gift of M. J. Bosquet, For. Cor. G. S., of Maestricht. It corresponds with De Koninck's figured specimen in size, but slightly differs in outline. It is $\frac{7}{12}$ ths inch in length. Side-view

¹ Geol. Survey Ireland Museum, Tablet 211 N. Referred to in 'Ann. Nat. Hist.,' ser. 3, vol. xviii, p. 48.

² This is the "Bowland Forest" of some maps, &c.—J. P.

subquadrate, with the antero-ventral and postero-dorsal regions slightly prominent. End-view ovate, broadest below. Edge-view long-ovate, broadest behind.

The transverse, vertical, and longitudinal diameters are as $6\frac{1}{2} : 7 : 8$. That of the circular depression around the Muscle-spot is as $4\frac{1}{2}$.

Muscle-spot (seen on the internal cast where the shell is wanting) oval, with about thirty-six radii; it is near the centre of a slightly raised circular area on the cast, corresponding with a depression on the inside of the shell, and the edge of which is indicated on the outside of the remaining portion of the shell by a faint curved furrow.

[These features are not shown on the figure.]

Figs. 4 *a—d*.—The shell (grey) of a very large and old individual from Bolland, Yorkshire (Prof. Morris, F.G.S.); $\frac{9}{12}$ ths inch in length. Side-view obliquely subovate; that is, obliquely truncate in front, with antero-dorsal prominence; and obliquely elliptical behind, the postero-dorsal region being depressed. End-view slightly ovate, nearly round. Edge-view oval.

Transverse, vertical, and longitudinal diameters as $8 : 9 : 10$.

Similar specimens abound in the Carboniferous Limestone of Kildare, Ireland.

Figs. 5 *a—d*.—A large dark-grey shell, slightly roughened by weathering, from Bolland (Prof. J. Morris, F.G.S.). It is $\frac{2}{3}$ rds inch in length. Similar occur in Kildare. Side-view suboval, truncate anteriorly, broadly elliptical behind. End-view broadly ovate, almost round. Edge-view subovate, truncate anteriorly.

Transverse diameter almost equal to the height, and nearly $\frac{6}{7}$ ths of the length.

Muscle-spot (shown by slight loss of surface) nearly round, with about fifty-two radii.

Figs. 6 *a—c*.—A neat little shell of a small, probably young male, specimen, from Bolland (Prof. Morris, F.G.S.). It is $\frac{1}{2}\frac{1}{4}$ ths inch long; like fig. 4 in shape, but smaller and less globose.

Diameters—Transverse as 9; vertical as 11; longitudinal as 13.

Entomoconchus Scouleri is known to us by specimens from the Carboniferous Limestone of Cork,¹ Kildare (see above), Meath,² and Limerick (collections of Sir R. Griffith, the late Mr. D. Sharpe, Mr. Joseph Wright, British Museum, and Geological Survey, Dublin and London); Bolland, Yorkshire (Profs. Phillips and Morris); Park Hill, near Longnor, Derbyshire (Geol. Survey, London); and Lower Scar Limestone, Settle, Yorkshire (Mr. J. H. Burrow).

The late Rev. J. G. Cumming quotes it from both the lower and middle stages of the

¹ "It is common in the limestone of Little Island, near Cork, but can rarely be got out perfect."—*J. Wright*. It is also found at Ballyvadoek, about two miles south-west of Middleton, Co. Cork, 'Ann. Nat. Hist.,' ser. 3, vol. xviii, p. 48, and 'Explanation of Sheets 187, 195, and 196, &c., Geol. Survey, Ireland,' 1864, p. 18 and p. 54.

² 'Annals Nat. Hist.,' ser. 3, vol. xviii, p. 48.

Carboniferous Limestone of the Isle of Man ('Quart. Journ. Geol. Soc.,' vol. ii, pp. 322; and 'Isle of Man,' p. 355).

At Visé, in Belgium, it is not rare in the white Carboniferous Limestone (De Koninck, Bosquet, Dupont¹).

2. ENTOMOCONCHUS ORBICULARIS. Sp. nov. Plate I, figs. 7 *a—c*.

Carapace suborbicular and compressed, one half inch long; vertical and longitudinal diameters nearly equal; transverse diameter (through both valves) rather more than half of either of the former; notch faint; antero-ventral keel strong. Side-view almost orbicular; truncate in front, and slightly contracted in the postero-ventral region. End-view acute oval, lenticular. Edge-view acute oval, lenticular.

Transverse, vertical, and longitudinal diameters as 8 : 14½ : 15.

One shell, much eaten away by weathering, collected by Mr. Joseph Wright, F.G.S., at Little Island, Cork; and in a specimen of the grey Carboniferous Limestone of Poolvash, sent to us from the Isle of Man by Mr. E. W. Binney, F.R.S., we find the cast of a small compressed *Entomoconchus* probably referable to this species.

3. ENTOMOCONCHUS GLOBOSUS. Sp. nov. Plate V, figs. 10 *a—g*.

Carapace globular, its length slightly exceeding its height or thickness, which are equal. Profiles nearly orbicular. Side-view faintly elliptical. Edge-view suboval. End-view round, with a slight ventral flattening.

The "beak" is more distinct than in either *Entomoconchus Scouleri* or *E. orbicularis*, and the lower portion of the "gape" is continued much further into the ventral region than in either of the other two species. The breast-angle is wanting in *E. globosus*; the hinder margin is well rounded, and bears a trace of a submedian spine.

The Muscle-spot is of the usual type and very distinct. The surface of the valve exhibits also some traces of reticular structure or ornament.

Length ⅓; height ⅔; thickness ⅔ inch. Proportions 16 : 13 : 13.

Only one valve is known; from the Lower Limestone Series of West Broadstone, Beith, Ayrshire. Collected by Mr. John Young.

4. ENTOMOCONCHUS. Sp. nov. ?

In the British Museum is a rather small Belgian *Entomoconchus* from the Carboniferous Limestone of Visé, which has the general characters of *E. globosus*, with the

¹ 'Bullet. Acad. Roy. Belgique,' sér. 2, vol. xv, p. 110.

rounded front and low-placed gape, but it is longer and much narrower anteriorly, having an oval or elliptical profile. This may be a new species.

XI. OFFA.¹ Genus novum.

Carapace equivalve (?), subglobose, nearly equilateral, truncate in front, and impressed by a subcentral inturning of the anterior edge of each valve, representing the Cypridinal notch and equivalent to the upper gape in *Entomoconchus*.

M. Barrande figures two species of *Elpe* from the Upper Silurian rocks ("Fauna III, F, fig. 2") of Bohemia, one of which, *E. inchoata*, Bar., is globular, and in profile somewhat resembles our Carboniferous species; but the sinuated margin is the hinge-line in the Bohemian species. ('Syst. Sil. Bohême,' vol. i, Suppl., 1872, p. 511, pl. 26, figs. 10 a—e). *E. pinguis* is subreniform (*op. cit.*, p. 512, pl. 26, figs. 15 a—e).

1. OFFA BARRANDIANA. Sp. nov. Plate II, figs. 6 a—c.

Carapace-valve subquadrilateral, boldly curved above, nearly flat below, semicircular behind; truncate in front, with a small sinus or infolding of the edges in the upper third, sufficient to leave a slight fissure between the valves, as in *Entomoconchus*, though in a less degree.

Surface of valve smooth; impressed by the lateral extension of the sinus obliquely downwards for a short distance, and raised in a low boss a little above and in advance of the centre.

End and edge profiles long-compressed-obovate.

Offa Barrandiana is named after the eminent geologist of Bohemia, who has elucidated very many fossil Entomostraca. It is somewhat like *Entomoconchus Scouleri junior* in shape, but is less convex and the gape is very different. Its valves have a slight central boss, affecting the profiles of edge and end, which would otherwise be scarcely gibbose.

Length $\frac{1}{8}$; height $\frac{1}{7}$; thickness $\frac{1}{8}$ inch. Proportions $8\frac{1}{2} : 6\frac{1}{2} : 6$.

A grey shell in grey limestone from Middleton, Co. Cork, Ireland. On the same horizon as that of Little Island, and only a few miles distant. Collected by Mr. Joseph Wright, F.G.S.

¹ *Offa*, a pellet.

XII. POLYCOPE, *G. O. Sars.*

POLYCOPE, the only known type of the *Polycopidæ* (see p. 10), and belonging to the distinct section CLADOCOPA (see p. 6), has a bivalved carapace, recognisable by its circular or oval form, its obsolete sinus, and want of beak.¹

In the *Polycope* the notch is obsolete or absent, a faint indentation or sinus in some species indicating its place; in others it is not at all marked. In this group the antero-inferior region, if truncated, falls inwards or slopes obliquely downwards and backwards from the greatest prominence in front. This corresponds to some extent with the shape of those Cypridinads that have more beak than ventral keel, seeming to have a short chin, in strong contradistinction to those which have the "notch" high up, with or without a deep sinus, and with more or less projecting antero-ventral quarters.

1. POLYCOPE BURROVII. Sp. nov. Plate II, figs. 2 *a—c*.

Carapace equivalve (?), equilateral, subglobular, smooth. Side-view short-broad-ovate, slightly smaller anteriorly. End-view obovate, being broadest at the top. Edge-view long-ovate, broadest in front.

Muscle-spot obscurely visible. No indication of a notch or sinus.

Length $\frac{1}{8}$ inch. Proportions—length 7; height 6; thickness 5.

A few gregarious casts of *P. Burrovii*, some ferruginous, in grey Carboniferous Limestone, have been collected at Settle, Yorkshire, by Mr. J. H. Burrow, M.A., after whom the species is here named.

2. POLYCOPE SIMPLEX, *J. and K.* Plate II, figs. 1 *a—c*; 10; 12. Plate V, figs. 1 *a—d*.

CYPRIDINOPSIS SIMPLEX, *J. & K.*, 1871. Trans. Geol. Soc. Glasgow, vol. iii, Suppl., p. 26.

Carapace oval, compressed, smooth. A delicate marginal rim is seen on the ventral

¹ We do not know of any other fossil specimens besides these from the Carboniferous Limestone; but it appears to us possible that M. Barrande's *Primitia socialis* from the Silurian of Bohemia ('Sil. Syst. Bohême,' vol. i, Suppl., p. 551, pl. 26, figs. 11 *a—e*), which is globose, about $\frac{1}{10}$ th of an inch long, with oval outline and profile, circular end-view, and no notch, may be an ancient *Polycope*.

edge of some valves. The curvature of outline and the amount of gibbosity are variable. Side-view oval (sometimes ovate by increased ventral convexity); obliquely truncate at the antero-ventral region, and hence a slight angular anterior prominence. End-view narrow-obovate. Edge-view narrow-acute-oval.

A faint trace of the Muscle-spot occurs on some specimens.

No indication appears of a notch at or under the projecting angle. In this feature our little fossil resembles the very small existing *Polycope orbicularis*, Brady ('Trans. Lin. Soc.,' vol. xxvii, p. 471, pl. 35, figs. 53—57), which, however, is rounder and thicker, has an irregular reticulate ornament, and is indented with the very shallow and nearly obsolete sinus rather higher up on the front.

The fossil specimens (in a nodule) from Braidwood, Lanarkshire, show a neat reticulate structure of oblong meshes and scattered superficial pits. One small specimen is very much more ovate than the others, but this may be a character of age or of sex.

Carluke (Plate II, fig. 1). Length $\frac{1}{10}$ inch. Proportions—Length 10; height 7; thickness 5.
 Meath (fig. 12) " $\frac{2}{3}$ " " " 9; " 6.
 Cork (fig. 10) " $\frac{1}{5}$ " " " 10; " 7.

Polycope simplex is not rare. We have it from the Carboniferous Limestone of Little Island, Cork (Mr. Joseph Wright, F.G.S.); from Duleek, Co. Meath (a cast¹ in the Museum of the Geological Survey of Ireland); and a large specimen from limestone of the same age at Limerick. Probably of the same species, but not well exposed, are some imbedded specimens in the same limestone from the Isle of Man (Mr. E. W. Binney, F.R.S.).

A nodule of ironstone from Braidwood, near Carluke, Scotland, contained seventeen specimens (including impressions) of *P. simplex*, having brownish-grey shells, smooth, translucent, showing reticulate structure, and with a neat little ventral rim to some of the valves (Dr. Rankin's collection). We also refer to this species two small, smooth, compressed casts² from the Hosie Limestone series, South Hill, Campsie, near Glasgow, 660 fathoms below the Ell Coal (Mr. J. Young³).

Figs. 1 *a—c*.—Shell; magnified eight diameters; from Braidwood, Carluke.

Fig. 10.—A smooth grey shell; Cork.

Fig. 12.—A cast in limestone; Duleek, Meath, Ireland (Geol. Surv. Map, Sheet $\frac{27}{1}$).

This specimen from Duleek is one of some gregarious casts in a light-grey Carboniferous Limestone, and is restored in the figure from a wax impression. It shows obscurely

¹ Referred to as "*Cypridina primæva*" in the 'Annals Nat. Hist.,' ser. 3, vol. xviii, p. 48.

² These were associated with "*Cypridina primæva*" in the 'Glasgow List' of 1871, p. 27.

³ Mr. Young informs me that "this *Polycope* is found, with many marine shells, in dark-grey shale, lying upon the Hosie Limestone at Campsie and Kilbride. The beds are in the 'Lower Limestone series.' Craigenglen, which has yielded a great many species of the smaller Entomostraca, is on the same South Hill of Campsie. The beds lie under the 'Main Limestone,' and are therefore lower in position than the Hosie Limestone, which is 22 fathoms above the Main Limestone."

the Muscle-spot in the normal position, that is, in the antero-inferior region and towards the sloping margin.

Plate V, figs. 1 *a—d*.—Shells; magnified eight diameters, and ornament more highly magnified; from Braidwood, Carluke.

3. POLYCOPE YOUNGIANA, *J. and K.* Plate V, figs. 2 *a—f*.

CYTHERE? YOUNGIANA, *J. & K.*, 1867. Trans. Geol. Soc. Glasgow, vol. ii, p. 223.

CYPRIDINOPSIS — — 1871. *Ib.*, vol. iii, Suppl., p. 26.

Carapace ovate, somewhat narrower in front, and slightly pinched in or incurved at the anterior third of the ventral edge, without any definite notch being produced. End-view acute-oval. Edge-view long-acute-oval. Surface ornamented with long, concentric, interlacing or anastomosing and mesh-like striæ, very much like the ornament of *Cypris striolata*, Brady ('Annals Nat. Hist.,' ser. 3, vol. xiii, pl. 3, fig. 15). The ventral edge of at least the right valve has a marginal rim.

Length $\frac{1}{12}$; height $\frac{1}{15}$; thickness $\frac{1}{19}$ inch. Proportions 9 : $6\frac{1}{2}$: 5.

The specimens are pyritous, and were collected by Mr. John Young, Assistant-Curator of the Hunterian Museum in the University of Glasgow, in a marine shale of the Carboniferous series at South Hill Pit, Campsie. "Rather rare. A very local species. Lower Limestone, South Hill, Campsie; in dark-blue shale above the Hosie Limestone, with *Goniatites*, *Bellerophon*, *Nucula*, and *Spirifera Urei*; Carluke; in an ironstone nodule, in shale, First Kingshaw Limestone" (Suppl. *supra cit.*, p. 26).

The species is named after Mr. John Young, of Glasgow, one of the energetic palæontologists of Western Scotland who are successfully working out the natural history, geology, and fossils of Lanarkshire and the neighbouring districts.

THE
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A MONOGRAPH
OF THE
BRITISH FOSSIL
BIVALVED ENTOMOSTRACA

FROM THE
CARBONIFEROUS FORMATIONS.

BY
PROFESSOR T. RUPERT JONES, F.R.S., G.S., &c. &c. ;
JAMES W. KIRKBY, ESQ., &c. &c. ;
AND
PROFESSOR GEORGE S. BRADY, M.D., F.R.S., F.L.S., &c., &c.

PART I. No. 2.
THE CYPRIDINADÆ AND THEIR ALLIES.

CONTAINING
PAGES i—iii, 57—92; PLATES VI, VII.
WITH TITLE-PAGE AND DIRECTIONS FOR BINDING.

LONDON :
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1884.

Order.—PLATYCOPA. (See page 6.)

Family.—CYTHERELLIDÆ.

- CYTHERELLIDÆ, *G. O. Sars*, 1865. Oversigt af Norges marine Ostracoden: Forhandling i Videnskabs-Selskabet i Christiania, Aar 1864 (8vo, 1865), p. 124.
- *G. S. Brady*, 1866. Trans. Zool. Soc., v, p. 361.
- *G. S. Brady*, 1867. Intellectual Observer, xii, p. 116.
- *G. S. Brady*, 1868. Trans. Linn. Soc., xxvi, pp. 359 and 472.
- *Jones*, 1870. M. Microsc. Journ., iv, p. 187.
- *G. S. Brady*, 1878. Trans. Zool. Soc., x, p. 407.
- *G. S. Brady*, 1880. The Zoology of the Voyage of H.M.S. 'Challenger,' part iii, Report on the Ostracoda, p. 171.

This family is widely represented in the existing seas, and has long been represented in past time, by one genus, the typical *Cytherella*. *Cytherellina* and *Echmina* are grouped with it. There is also another form which Dr. G. S. Brady finds to be distinct from other Ostracods, and most nearly allied to *Cytherella*, though separated by some important features. This is the *Bosquetia*, B. C. and R., 'Monograph Post-Tertiary Entom.,' Pal. Soc., 1874, p. 220.

1. Genus CYTHERELLA (*Cythere* et *Cytherina* auctorum¹).

- CYTHERELLA (sub-genus), *Jones*, 1848. Monogr. Entom. Cretac., pp. 6, 7, 9, 14, 28.
- *Bosquet*, 1852. Mém. Couron. Acad. Belg., xxiv, p. 91.
- *Reuss*, 1853. N. Jahrb. f. Min., &c., 1853, p. 676 (a *Cythere*).
- *Bosquet*, 1854. Mém. Commiss. Carte Géol. Neerland., ii, p. 53.
- *Reuss*, 1854. Deutsch. Akad. Wiss. Wien, vii, p. 140.
- *Reuss*, 1855. Zeitsch. Deutsch. geol. Gesell., vii, p. 277.
- *Bornemann*, 1855. Zeitsch. Deutsch. geol. Ges., vii, p. 354.
- (sub-genus), *Jones*, 1856. Monogr. Tertiary Entom., pp. 4, 6, 9, 10, 22, 54.
- *Egger*, 1858. N. Jahrb. f. Min., &c., 1858, p. 404.
- *Reuss*, 1860. Sitzungsber. math.-nat. Cl. k. Akad. Wiss. Wien, xxix, p. 271.
- *Brady*, 1866. Trans. Zool. Soc., v, p. 361.
- *Brady*, 1867. Intell. Observ., xii, p. 129.
- *Brady*, 1868. Trans. Linn. Soc., xxvi, p. 472.
- *Jones*, 1869. Palæoz. Biv. Entom., Geol. Assoc., p. 5.
- *Jones*, 1873. Month. Microsc. Journ., x, p. 75.

¹ See Chronological List of the *Cytherellæ* further on.

- CYTHERELLA *H. Woodward*, 1877. Catal. Brit. Fossil Crustacea, p. 109.
 — *Brady*, 1878. Trans. Zool. Soc., x, p. 407.
 — *Terquem*, 1878. Mém. Soc. Géol. France, sér. 3, vol. i, p. 194.
 — *Bigsby*, 1878. Thesaurus Devonico-Carboniferus, p. 249.
 — *Brady*, 1880. Report Ostrac., p. 171.

Carapace bivalved, oblong or subovate, compressed, especially in front. Valves unequal, thick, mostly plain and even, but occasionally raised in low undulations, ridges, or knobs; surface generally smooth, but sometimes pitted, reticulate, or granulose; terminal denticulations rare. Contact-margin of the right (larger) valve grooved or rabbetted on its inner edge for the reception of a flange presented by the contact-margin of the left (smaller) valve; both groove and flange stronger at the posterior than at the anterior portion of the valve. A small roundish depression near the centre of the valve externally is represented within by a faint elevation or tubercle; and in this the *lucid spots* are arranged in a transverse, curved, pinnate, or plume-shaped series of from twelve to sixteen, linear-oblong in shape, and usually increasing in length towards the ventral margin.

Of the internal structure of the animal we have the following particulars, from the observations of G. O. Sars:

“Antennæ very large; the upper many-jointed, and geniculate at the base; the lower broad and flattened, with a large pectinato-setose palp. Three pairs of hinder limbs, scarcely pediform; the two anterior pairs branchial, the others rudimentary. Abdomen terminating in two very small, narrow, and spiniferous laminae.”

“From this definition of the genus,” G. S. Brady observes, “it will be seen that it differs very remarkably from all hitherto known forms, presenting in the conformation of the lower antennæ a remarkable approach to the *Copepoda*, and in the palps of the mandibles and first pair of jaws a likeness to the *Sididæ*. The way in which the animal uses its powerful limbs is not known, it never having been observed in the living state.”—G. S. Brady, ‘Trans. Linn. Soc.,’ xxvi, p. 473.

The following Synopsis of the known species, fossil and recent, arranged according to date of publication, will be useful. The dates placed in parentheses belong to species previously described.

List of the known CYTHERELLÆ and BOSQUETIA, arranged according to date of publication.

[In many cases the species, and in some instances the genus, requires re-examination.]

- 1830 *Cytherella compressa* (*Cythere*, Münster), Jahrb. f. Min. &c., 1830, p. 64.
 Tertiary.
 1830 — ? *inflata* (*Cythere*, Münster), Jahrb. f. Min. &c., 1830, p. 65, No.
 17. Carboniferous.

- (1835) *Cytherella compressa* (*Cythere*, Münster), N. Jahrb. f. Min. &c., 1835, p. 445.
Tertiary.
- 1838 — *Muensteri* (*Cytherina*, Römer), Neues Jahrb., 1838, p. 516, No. 13,
pl. 6, f. 13. Tertiary.
- (1838) — *compressa* (*Cythere*, Münster, and *Cytherina*, Römer), Neues Jahrb.,
1838, p. 517, No. 14, pl. 6, f. 14. Tertiary.
- 1838 — *aciculata* (*Cytherina* Römer), N. Jahrb. 1838, p. 517, pl. 6, f. 21
(*apud* Bosquet). Tertiary.
- 1838 [— *ovata*] (*Cytherina*, Lyell and Lonsdale), Elem. Geol., p. 55, woodcut,
f. 19. Cretaceous.
- 1840 — — (*Cytherina*, Römer), Verst. Kreid., p. 104, No. 4, pl. 16, f. 21.
Cretaceous.
- 1843 — *pedata* (*Cytherina*, Geinitz), Verst. Kiesling. Nachtrag, &c., p. 6, pl.
5, f. 13 (*apud* Bosquet, Mém. Com. Carte géol. Neer-
land., vol. ii, p. 62 =? *C. Williamsoniana*). Creta-
ceous.
- 1845 — *parallela* (*Cytherina*, Reuss), Verst. Böhm. Kreid., p. 16, pl. 5, f. 33.
Cretaceous.
- 1845 — *complanata* (*Cytherina*, Reuss), Verst. Böhm. Kr., p. 16, pl. 5, f. 34.
Cretaceous.
- (1845) — *ovata* (*Cytherina*, Reuss), Verst. Böhm. Kr., p. 16, pl. 5, f. 35. Cretac.
- 1845 — *elongata* (*Cytherina*, Reuss), Verst. Böhm. Kr., p. 16, pl. 5, f. 36.
Cretaceous.
- 1845 —? *asperula* (*Cytherina*, Reuss), Verst. Böhm. Kr., p. 16, pl. 5, f. 37.
Cretaceous.
- 1846 — *solenoides* (*Cytherina*, Reuss), Verst. Böhm. Kr., p. 104, pl. 24, f. 14.
Cretaceous.
- 1846 —? *amygdaloides* (in part), (*Cythere*, Cornuel), Mém. Soc. Géol. France,
sér. 2, i, p. 197, pl. 8, f. 5—9. Cretaceous or Neocomian.
- 1847 — *serrata* (*Cytherina*, Williamson), Trans. Manch. Phil. Soc., viii, p. 79,
pl. 4, f. 79; and ser. 3, v, p. 136, 1872 (=? *William-
soniana*). Cretaceous.
- 1847 — *lævis* (*Cytherina*, Williamson), Trs. Manch. Ph. Soc., viii, p. 79, pl. 4,
f. 80; ser. 3, v, p. 136, 1872 (=? *Muensteri*). Cretac.
- 1847 — *reniformis* (*Cytherina*, Bosquet), Mém. Soc. R. Liège, iv, p. 356,
pl. 1, f. 1, *a—f*. Cretaceous.
- 1847 — *truncata* (*Cythere*, Bosquet), Mém. Soc. R. Liège, iv, p. 357, pl. 1,
f. 2, *a—e*. Cretaceous.
- 1847 — *auricularis* (*Cypridina*, Bosquet), Mém. Soc. R. Liège, iv, p. 366,
pl. 3, f. 2, *a—d*. Cretaceous.

- (1848) *Cytherella ovata* (*Cytherina*, Römer), Jones, Mon. Cret. Entom., p. 28, pl. 7, f. 24, *a—i*; and Geol. Mag., vii, 1870, p. 76. Cretaceous.
- (1848) — *truncata* (*Cythere*, Bosquet), Jones, Mon. Entom. Cret., p. 30, pl. 7, f. 25, *a—e*; and Geol. Mag., vii, 1870, p. 76. Cretaceous.
- 1848 — *Williamsoniana*, Jones, Mon. Entom. Cret., p. 31, pl. 7, f. 26, *i*; and Geol. Mag., vii, 1870, p. 76. Cretaceous.
- 1848 — *Williamsoniana*, var. *granulosa*, Jones, Mon. Entom. Cret., p. 31, pl. 7, f. 26, *i*. Cretaceous.
- 1848 —? *Mantelliana*, Jones, Mon. Entom. Cret., p. 32, pl. 6, f. 22, *a—c*; and Geol. Mag., vii, 1870, p. 76. Cretaceous.
- (1849) — *compressa* (*Cythere*, Münster; *Cytherina*, Reuss), Haid. Abh., iii, p. 54, pl. 8, f. 15, *a, b*. Tertiary.
- 1850 — *nuciformis*, Jones, in King's Mon. Perm. Foss., p. 64, pl. 18, f. 11, *a—c*; Trans. Tyneside Nat. Field Club, iv, 1859, p. 40, (*Cythere*); pl. 11, f. 7, *a—c*. Permian.
- (1850) — *parallela* (*Cytherina*, Alth), Haid. Abhandl., iii, pt. 2, p. 197, pl. 10, f. 19. Cretaceous.
- (1850) — — (*Cytherina*, Reuss), Haid. Abhandl., iv, p. (31) 48, pl. 6, f. 1. Cretaceous.
- (1850) — *ovata* (*Cytherina*, Römer & Reuss), Haid., Abth. iv, p. 32, pl. 6, f. 2. Cretaceous.
- 1850 — *Leopolitana* (*Cytherina*, Reuss), Haid., Abth. iv, p. 32, pl. 6, f. 3. Cretaceous.
- 1850 — *leioptycha* (*Cypridina*, Reuss), Haid., Abth. iv, p. (33) 49, pl. 6, f. 11, *a—c*. [*Apud* Bosquet, Mém. Comm. Carte géol. Neerl., ii, p. 62, *C. Williamsoniana*.] Cretaceous.
- 1851 — *Beyrichi* (*Cytherina*, Reuss), Zeitsch. geol. Ges., iii, p. 89, pl. 7, f. 65. Tertiary.
- (1852) — *compressa* (*Cythere*, Münster), Bosquet, Mém. Cour. Acad. Belg., xxiv, p. 11, pl. 1, f. 1, *a—f*. Tertiary.
- (1852) — *Muensteri* (*Cytherina*, Römer), Bosquet, Mém. Cour. Acad. Belg., xxiv, p. 13, pl. 1, f. 2, *a—d*. Tertiary.
- 1852 — *hieroglyphica*, Bosquet, Mém. Cour. Acad. Belg., xxiv, p. 15, pl. 1, f. 3, *a—d*. Tertiary.
- 1852 — *Jonesiana*, Bosquet., Mém. Cour. Acad. Belg., xxiv, p. 16, pl. 1, f. 4, *a—d*. Tertiary.
- (1854) — *nuciformis* (*Cytherella*? Jones), Reuss, Jahresb. Wetter. Ges. Hanau, für 1851-3, p. 68, pl. —, f. 9, *a, b*. Permian.

- (1854) *Cytherella ovata* (*Cythere*, Römer), Bosquet, Mém. Comm. Carte géol. Neerl., p. 55, pl. 8, f. 1, *a—f*. Cretaceous.
- (1854) — *Muensteri* (*Cytherina*, Römer), Bosquet, Mém. Comm. Carte géol. Neerl., ii, p. 58, pl. 8, f. 2. Cretaceous.
- (1854) — *auricularis*, Bosquet, Mém. Comm. Carte géol. Neerl., ii, p. 60, pl. 4, f. 19, *a—d*. Cretaceous.
- 1854 — *denticulata*, Bosquet, Mém. Comm. Carte géol. Neerl., ii, p. 61, pl. 5, f. 1, *a—d*. Cretaceous.
- (1854) — *Williamsoniana*, Jones, Bosquet, Mém. Comm. Carte géol. Neerl., ii, p. 62, pl. 5, f. 2, *a—d*. Cretaceous.
- (1854) — *Leopolitana*, Reuss, Denksch. Akad. Wien, vii, p. 140, pl. 27, f. 4, *a—c*. Cretaceous.
- (1854) — *complanata* (*Cytherina*, Reuss), Denks. Akad. Wien, vii, p. 140, pl. 28, f. 9, *a, b*. Cretaceous.
- (1855) — — Reuss, Zeitsch. g. G., vii, p. 277. Cretaceous.
- (1855) — *nuciformis*, Richter, Zeitsch. g. G., vii, p. 529, pl. 26, f. 8, 9. Permian.
- (1855) — *parallela*, Reuss, Zeitsch. g. G., vii, p. 278. Cretaceous.
- (1855) — *Beyrichi* (*Cytherina*, Reuss), Bornemann, Zeitsch. g. G., vii, p. 354, pl. 20, f. 1. Tertiary.
- 1855 — *fabacea*, Bornemann, Zeitsch. g. G., vii, p. 355, pl. 20, f. 2. Tertiary.
- 1855 — *intermedia*, Bornemann, Zeitsch. g. G., vii, p. 355, pl. 20, f. 3. Tertiary.
- (1856) — *compressa* (*Cythere*, Münster), Jones, Mon. Tert. Ent., p. 54, pl. 5, f. 21, 23; Geol. Mag., vii, 1870, p. 157. Tertiary.
- (1856) — — (*Cythere*, Münster), var. 1 (= *C. Beyrichi*, Born.), Jones, Mon. Tert. Ent., p. 55, pl. 5, f. 18; and Geol. Mag., vii, 1870, p. 157. Tertiary.
- (1856) — — (*Cythere*, Münster), var. 2 (= ? *C. intermedia*, Born.), Jones, Mon. Tert. Ent., p. 55, pl. 5, f. 19; and Geol. Mag., vii, 1870, p. 157. Tertiary.
- (1856) — *Muensteri* (*Cytherina*, Römer), Jones, Mon. Tert. Ent., p. 56, pl. 5, f. 13; and Geol. Mag., vii, 1870, p. 76. Tertiary.
- 1856 — *Londinensis*, Jones, Mon. Tert. Ent., p. 55, pl. 5, f. 20, 22. Tertiary.
- (1858) — *Jonesiana*, Bosquet, Egger, Neues Jahrb. 1858, p. 404, pl. 25, f. 1, *a—c*. Tertiary.
- (1858) — *compressa* (*Cythere*, Münster), Egger, Neues Jahrb. 1858, p. 404, pl. 25, f. 2, *a—c*. Tertiary.
- 1858 — *inflexa*, Egger, N. Jahrb. 1858, p. 404, pl. 25, f. 3, *a—c*. Tertiary.
- (1861) — *nuciformis*, Jones (*Cythere*, Geinitz), Dyas, p. 31, woodcut, f. 1, *a—b*. Permian.

- 1861 *Cytherella*? *ovalis* (*Cythere*, Stottard), Ann. Mag. N. H., ser. 3, vol. viii, p. 489, pl. 18, f. 5. Carboniferous.
- (1863) — *Beyrichi* (*Cytherina*, Reuss), Speyer, Ostrac. Cass. Tert., p. 54, pl. 1, f. *a—c*. Tertiary.
- 1863 — *transversa*, Speyer, Ostrac. Cass. Tert., p. 56, pl. 1, f. 2, *a—c*. Tertiary.
- 1865 — *abyssorum*, G. O. Sars, Overs. Norg. Mar. Ostrac., in Forhand. Vidensk. Christiania, Aar 1864, p. 125. Recent.
- (1865) — ? *inflata* (*Cythere*, Münster), Jones and Kirkby, Ann. Mag. N. H., ser. 3, xv, p. 408, pl. 20, f. 8, *a—c*. Carboniferous.
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|------|---|-----------------------------|----------|--|
| 1865 | — | <i>ampla</i> , Terquem | } p. 119 | } Mém. Soc. Géol. France, sér. 2, vol. viii, pp. 119, 120. (Only names, no figures.) Lower Lias. |
| 1865 | — | <i>breviata</i> , Terquem | | |
| 1865 | — | <i>notabilis</i> , Terquem | | |
| 1865 | — | <i>polita</i> , Terquem | | |
| 1865 | — | <i>propinqua</i> , Terquem | | |
| 1865 | — | <i>papyracea</i> , Terquem | | |
| 1865 | — | <i>tenella</i> , Terquem | | |
| 1865 | — | <i>nummularis</i> , Terquem | | |
| 1865 | — | <i>Metensis</i> , Terquem | } p. 120 | |
| 1865 | — | <i>matutina</i> , Terquem | | |
- 1866 — *subcylindrica* (*Bairdia*, Sandberger), N. Jahrb. f. M., 1866, p. 41; and Verh. geol. Reichs., 1868, p. 190, and p. 210? Triassic.
- 1866 — *pulchra*, Brady, Trans. Zool. Soc., v, 361, pl. 57, f. *a—d*. Recent.
- 1866 — *punctata*, Brady, Trans. Zool. Soc., v, 362, pl. 57, f. 2, *a, b*. Recent.
- (1866) — *Beyrichi* (*Cytherina*, Reuss), Brady, Trans. Zool. Soc., v, 362, pl. 57, f. 3, *a, b*. Recent.
- 1866 — *rugosa*, Brady, Trans. Zool. Soc., v, 362, pl. 57, f. 4, *a, b*. Recent.
- 1867 — *Scotica*, Brady, Brit. Assoc. Report for 1866, p. 211. Recent.
- 1867 — *lævis*, Brady, Brit. Assoc. Report for 1866, p. 211. Recent.
- 1867 — *fraterna* (*Cythere*, Reuss), Sitz. Akad. Wien, lv, Abth. i, p. 284, pl. —, f. 7. Triassic.
- (1867) — *nuciformis*, Jones (*Cythere*, Richter), Zeitsch. D. g. G., xix, p. 227, pl. 5, f. 7. Permian.
- (1867) — ? *inflata* (*Cythere*, Münster), Jones and Kirkby, Trans. Geol. Soc. Glasgow, ii, p. 218; and iii Suppl., 1871, p. 28. Carboniferous.
- 1867 — *simplex*, Jones and Kirkby, Trans. Geol. Soc. Glasgow, ii, p. 218; and iii Suppl. 1871, p. 28. Carboniferous.

- 1867 *Cytherella aspera*, Jones, Quart. Journ. Geol. Soc., xxiii, pp. 467, 497, 503, 509, and 559. Lias.
- 1867 —? *Gingensis* (*Bairdia*, Waagen), in Benecke's Beiträge, vol. i, 1868, p. 586, pl. 34, f. 1. Jurassic.
- 1868 — *limbata*, Reuss, Sitz. Akad. Wiss. Wien, lvii, 1 Abth., p. 108. Triassic and Jurassic.
- (1868) — *Scotica*, Brady, Trans. Lin. Soc., xxvi, p. 473, pl. 34, f. 18—21. Recent.
- (1868) — *lævis*, Brady, Trans. Lin. Soc., xxvi, p. 474, pl. 34, f. 15—17. Recent.
- 1868 — *cavernosa*, Brady, Fonds de la Mer, p. 65, pl. 8, f. 13, 14. Recent.
- 1868 — *semitalis*, Brady, Fonds de la Mer, p. 72, pl. 8, f. 23, 24. Recent.
- 1869 — *Raibliana*, Gümbel, Jahrb. geol. Reichs., xix, p. 183, pl. 6, f. 32. Triassic.
- (1869) — *subcylindrica* (*Bairdia*, Sandberger), Gümbel, Jahrb. geol. Reichs., xix, p. 183, pl. 6, f. 35. Triassic.
- 1869 —? *tuberculifera* [*C. tubulifera* in the explanation of the plate], (*Cythere*, Gümbel), Jahrb. geol. Reichs., xix, p. 184, pl. 6, f. 37, *a, b*. Triassic.
- 1869 — *truncata*, Brady, Fonds de la Mer, p. 154, pl. 19, f. 3, 4. Recent.
- 1869 — *cingulata*, Brady, Fonds de la Mer, p. 159, pl. 16, f. 24, 25. Recent.
- 1869 — *polita*, Brady, Fonds de la Mer, p. 161, pl. 19, f. 5—7. Recent.
- 1869 — *nitida*, Brady, Fonds de la Mer, p. 163, pl. 19, f. 8, 9. Recent.
- 1870 — *brevis*, Jones, Month. Microsc. Journ., iv, p. 185, pl. 61, f. 4; and vol. x, 1873, p. 75. Carboniferous.
- (1870) — *Muensteri* (*Cytherina*, Römer), var. *rectipunctata*, Jones, Geol. Mag., vii, p. 157 (Mon. Tert. Entom., p. 56, pl. 5, f. 12). Tertiary.
- 1870 — *cuneolus*, Brady, Fonds de la Mer, p. 192, pl. 19, f. 18, 19. Recent.
- 1871 — *Ulmensis*, Gümbel, Sitz. Akad. Wiss. math.-phys. Cl. München, 1871, p. 71, pl. 1, f. 22. Jurassic.
- 1871 —? — (*Bairdia*, Gümbel), Sitz. Akad. München, 1871, p. 71, pl. 1, f. 23. Jurassic.
- 1871 —? *grossefoveata* (*Bairdia*, Gümbel), Sitz. Akad. München, 1871, p. 71, pl. 1, f. 24. Jurassic.
- 1874 *Bosquetia robusta*, G. S. Brady, Crosskey, and Robertson, Mon. Post-tert. Entom., p. 220, pl. 12, f. 18—21. Post-tertiary.
- 1875 *Cytherella Murchisoniana*, Jones and Kirkby, Ann. Mag. Nat. Hist., ser 4, vol. 15, p. 57, pl. 6, f. 13, *a, b*, 14, *a, b*. Carboniferous.
- 1876 —? *paupercula*, Blake, Lias of Yorkshire, p. 433, pl. 19, f. 13. Lias.

- 1876 *Cytherella circumscripta*, Blake, Lias of Yorkshire, p. 434, pl. 19, f. 14. Lias.
 1876 — *crepidula*, Blake, Lias of Yorkshire, p. 434, pl. 19, f. 15. Lias.
 (1878) — *parallela* (Reuss), G. S. Brady, Trans. Zool. Soc., vol. x, p. 407,
 pl. 62, f. 2. Tertiary.
 1878 — *nodosa*, G. S. Brady, Trans. Zool. Soc., vol. x, p. 407, pl. 62, f. 2.
 Tertiary.
 1878 — *elliptica*, G. S. Brady, Trans. Zool. Soc., vol. x, p. 407, pl. 62, f. 6.
 Tertiary.
 1878 — *Fischeri*, Terquem, Mém. Soc. géol. France, sér. 3, vol. ii, p. 94,
 pl. 15, f. 21, *a—d*. Tertiary.
 (1880) — *polita*, G. S. Brady, Challenger Report, p. 172, pl. 43, f. 5, *a—c*;
 and pl. 44, f. 1, *a—g*. Recent.
 1880 — *lata*, G. S. Brady, Challenger Report, p. 173, pl. 44, f. 5, *a—e*.
 Recent.
 1880 — *dromedaria*, G. S. Brady, Challenger Report, p. 173, pl. 43, f. 6,
a, b. Recent.
 (1880) — *truncata*, G. S. Brady, Challenger Report, p. 174, pl. 36, f. 3, *a—d*.
 Recent.
 (1880) — *pulchra*, G. S. Brady, Challenger Report, p. 174, pl. 44, f. 3, *a—b*.
 Recent.
 (1880) — *punctata*, G. S. Brady, Challenger Report, p. 174, pl. 36, f. 6, *a, b*;
 and pl. 44, f. 4, *a—g*. Recent.
 (1880) — *semitalis*, G. S. Brady, Challenger Report, p. 175, pl. 44, f. *a—e*.
 Recent.
 1880 — *venusta*, G. S. Brady, Challenger Report, p. 176, pl. 43, f. 4, *a—d*.
 Recent.
 1880 — *cribrosa*, G. S. Brady, Challenger Report, p. 176, pl. 26, f. 5, *a—d*.
 Recent.
 1880 — *cavernosa*, G. S. Brady, Challenger Report, p. 177, pl. 36, f. 5, *a—d*.
 Recent.
 (1880) — *cingulata*, G. S. Brady, Challenger Report, p. 177, pl. 43, f. 1, *a—g*,
 and f. 2, *a—d*. Recent.
 1880 — *irregularis*, G. S. Brady, Challenger Report, p. 178, pl. 43, f. 3, *a—c*.
 Recent.
 1880 — *latimarginata*, G. S. Brady, Challenger Report, p. 178, pl. 26, f. 7,
a—d. Recent.

To indicate the common and the rarer modifications of form which the valves of this genus present, the following Table has been constructed. In it the chief divisions, based

on these differences, are shown to be 26 forms of Group I, having an even and smooth surface, a more or less elliptical outline, and a cuneiform profile or edge-view; and 6 having a lanceolate (not cuneiform) profile, and approaching *Bosquetia* in this respect. In the same group 13 have a punctate surface to their smooth, more or less elliptical valves, with wedge-shaped profile; and 2 have a reticulate ornament. In Group II the valves, more or less oblong, have an uneven surface; 13 of them are smooth; 1 granu-lose; and 8 punctate. The grouping of these little organisms does not appear to be at all coincident in detail with their "range in time."

Synoptical arrangement of the CYTHERELLA and BOSQUETIA, according to the Shape and other features of their Carapace-valves.

CYTHERELLA AND BOSQUETIA.

I. Surface even. A. Smooth.

§ 1. Outline elliptical, more or less ovate, and suboblong; with cuneiform profile.

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|--|--|---|---|----------------|
| 1. Broadly elliptical. | <i>Cytherella brevis</i> , Jones, 1870 | . | . | Carboniferous. |
| 2. Elliptical-ovate. | Lonsdale in Lyell, 1838; <i>Cytherella ovata</i> ,
Roemer, 1840? 1841; Reuss, 1845; Jones, 1848; Reuss,
1850; Bosquet, 1854. The outline varies in the several figures | . | . | Cretaceous. |
| 3. Elliptical. | <i>Cytherella complanata</i> , Reuss, 1845 (narrow), and 1854
(elliptical) | . | . | Cretaceous. |
| 4. Elliptical. | <i>Cytherella Leopolitana</i> , Reuss, 1850 (subelliptical);
Reuss, 1854 | . | . | Cretaceous. |
| 5. Subelliptical. | <i>Cytherella lævis</i> , G. S. Brady, 1868 | . | . | Recent. |
| 6. Elliptical; with pit. | <i>Cytherella compressa</i> , Münster, 1838; Reuss,
1849; Bosquet, 1852; Jones, 1856; Egger, 1858. Outline
varies in the different figures | . | . | Tertiary. |
| 7. Elliptical and pointed (ovate). | <i>Cytherella elongata</i> , Reuss, 1845 | . | . | Cretaceous. |
| 8. Subelliptical. | <i>Cytherella lata</i> , G. S. Brady, 1880 | . | . | Recent. |
| 9. Subovate or subelliptical. | <i>Cytherella fabacea</i> , Bornemann, 1855 | . | . | Tertiary. |
| 10. Subovate. | <i>Cytherella nuciformis</i> , Jones, 1850; Reuss, 1854;
Richter, 1855 and 1867; Geinitz, 1861 | . | . | Permian. |
| 11. Subovate or subelliptical; with pit; margined. | <i>Cytherella Londi-
nensis</i> , Jones, 1856 | . | . | Tertiary. |
| 12. Suboblong. | <i>Cytherella truncata</i> , ¹ Bosquet, 1847; Jones, 1848 | . | . | Cretaceous. |

¹ For the *truncata* of G. S. Brady, 1869, see further on.

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|---|-------------------------------|
| 13. Suboblong; humped. <i>Cytherella dromedaria</i> , G. S. Brady, 1880 . | Recent. |
| 14. Suboblong, with anterior margin, and pinched. <i>Cytherella?</i>
<i>Ulmensis</i> , Gümbel, 1871 | Jurassic. |
| 15. Oblong. <i>Cytherella fraterna</i> , Reuss, 1867 | Trias. |
| 16. Oblong (broad). <i>Cytherella scotica</i> , G. S. Brady, 1868 . | Recent. |
| 17. Oblong; with pit. <i>Cytherella pulchra</i> , G. S. Brady, 1865 and
1880. (Not quite cuneiform in profile) | Recent. |
| 18. Oblong. <i>Cytherella Murchisoniana</i> , Jones and Kirkby, 1875 . | Carboniferous. |
| 19. Oblong (narrow). <i>Cytherella solenoides</i> , Reuss, 1845 | Cretaceous. |
| 20. Oblong (narrow) and pinched. <i>Cytherella parallela</i> , Reuss, 1845
and 1850; Alth, 1850; G. S. Brady, 1878 | } Cretaceous and
Tertiary. |
| 21. Oblong (narrow). <i>Cytherella lævis</i> , Williamson, 1847 (? =
<i>Muensteri</i>) | |
| 22. Oblong (narrow). <i>Cytherella Muensteri</i> , Roemer, 1838; Bosquet,
1850; Jones, 1856 | Tertiary. |
| 23. Oblong and pinched in. <i>Cytherella inflexa</i> , Egger, 1858 . | Tertiary. |
| 24. Oblong and pinched in. <i>Cytherella Fischeri</i> , Terquem, 1878 . | Tertiary. |
| 25. Suboblong, but curved. <i>Cytherella Gingensis</i> , Waagen, 1868 . | Jurassic. |
| 26. Subreniform. <i>Cytherella reniformis</i> , Bosquet, 1847 | Cretaceous. |

I. Surface even. A. Smooth. § 2. Outline elliptical and suboblong; profile not cuneiform, but more or less lanceolate.

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|---|----------------|
| 1. Elliptical. <i>Bosquetia robusta</i> , Brady, R. and C., 1874 | Post-tertiary. |
| 2. Elliptical. <i>Cytherella?</i> <i>ovalis</i> , Stottard, 1861 | Carboniferous. |
| 3. Elliptical. <i>Cytherella?</i> <i>amygdaloides</i> , in part, Cornuel, 1846 | Neocomian. |
| 4. Suboblong, margined, and slightly pinched. <i>Cytherella?</i> <i>Mantel-</i>
<i>liana</i> , Jones, 1848 | Cretaceous. |
| 5. Subovate. <i>Cytherella?</i> <i>inflata</i> , Münster, 1830; Jones and Kirkby,
1865 | Carboniferous. |
| 6. Subovate. <i>Cytherella Tatei</i> , Jones, 1884 | Carboniferous. |

I. Surface even. B. Punctate.

Outline ovate, subovate, suboblong, and oblong; profile wedge-like.

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| 1. Elliptical. <i>Cytherella elliptica</i> , G. S. Brady, 1878 | Tertiary. |
| 2. Elliptical. <i>Cytherella polita</i> . G. S. Brady, 1869 | Recent. |

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| 3. Elliptical (broad); with pit. <i>Cytherella Muensteri</i> , Roemer, 1838;
Bosquet, 1852. (The published figures vary) | Tertiary. |
| 4. Elliptical (broad); with pit. <i>Cytherella nitida</i> , G. S. Brady, 1869 | Recent. |
| 5. Elliptical and oblong; with pit. <i>Cytherella Beyrichi</i> , Reuss, 1851;
Bornemann, 1855; Speyer, 1863; G. S. Brady, 1866. (The
published figures vary) | } Recent and
Tertiary. |
| 6. Elliptical; with anterior border. <i>Cytherella?</i> <i>grossefoveolata</i> ,
Gümbel, 1871 | |
| 7. Oblong; with pit. <i>Cytherella punctata</i> , G. S. Brady, 1866 | Recent. |
| 8. Oblong (broad), but tapering. <i>Cytherella intermedia</i> , Bornemann,
1855 | Tertiary. |
| 9. Oblong (broad). <i>Cytherella compressa</i> , ¹ Münster, 1838; and
varieties <i>Beyrichi</i> and <i>intermedia</i> , Jones, 1856. (The pub-
lished figures vary) | Tertiary. |
| 10. Oblong. <i>Cytherella semitalis</i> , G. S. Brady, 1868 | Recent. |
| 11. Oblong. <i>Cytherella?</i> <i>aciculata</i> , Roemer, 1838 | Tertiary. |
| 12. Oblong (narrow). <i>Cytherella?</i> <i>asperula</i> , Reuss, 1845 | Cretaceous. |
| 13. Oblong, pinched; with faint pit. <i>Cytherella transversa</i> , Speyer,
1863 | Tertiary. |

I. Surface even. C. Surface reticulate and foveolate.

Outline subovate or sub-oblong; profile cuneiform.

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|--|---------|
| 1. Oblong. Reticulate. <i>Cytherella venusta</i> , G. S. Brady, 1880 | Recent. |
| 2. Oblong. Foveolate. <i>Cytherella cribrosa</i> , G. S. Brady, 1880 | Recent. |

II. Surface uneven. A. Smooth.

- | | |
|--|-------------|
| 1. Suboblong. <i>Cytherella cingulata</i> , G. S. Brady, 1869 | Recent. |
| 2. Suboblong. <i>Cytherella crepidula</i> , Blake, 1876 | Lias. |
| 3. Oblong (broad). <i>Cytherella Williamsoniana</i> , Jones 1848 (= ? <i>ser-
rata</i> , Wills.) | Cretaceous. |
| 4. Oblong. <i>Cytherella auricularis</i> , Bosquet, 1847 and 1854 | Cretaceous. |
| 5. Oblong. <i>Cytherella cavernosa</i> , G. S. Brady, 1868 | Recent. |
| 6. Oblong. <i>Cytherella leiopycha</i> , Reuss, 1850 | Cretaceous. |
| 7. Oblong. <i>Cytherella Ulmensis</i> , Gümbel, 1871 | Jurassic. |
| 8. Oblong; with pit. <i>Cytherella hieroglyphica</i> , Bosquet, 1852 | Tertiary. |
| 9. Oblong; with pit. <i>Cytherella denticulata</i> , Bosquet, 1854 | Cretaceous. |
| 10. Oblong; slightly uneven. <i>Cytherella truncata</i> , G. S. Brady, 1869 | Recent. |

¹ See note on this species in the 'Geol. Mag.,' vol. vii, 1870, p. 157.

11. Oblong; sulcate across. *Cytherella subcylindrica*, Sandberger, 1866 ;
 Gümbel, 1869 Trias.
12. Oblong (narrow); margined. *Cytherella Raibliana*, Gümbel, 1869 Trias.
13. Oblong (narrow); with tubular spines. *Cytherella?* *tuberculifera*,
vel tubulifera, Gümbel, 1869 Trias.

II. Surface uneven. B. Granulose.

1. Oblong (broad). *Cytherella Williamsoniana*, var. *granulosa*, Jones,
 1848 Cretaceous.

II. Surface uneven. C. Punctate.

1. Suboblong. *Cytherella Jonesiana*, Bosquet, 1852; Egger, 1858 . Tertiary.
2. Suboblong. *Cytherella nodosa*, G. S. Brady, 1878 . Tertiary.
3. Suboblong. *Cytherella cuneolus*, G. S. Brady, 1870 . Recent.
4. Suboblong; with pit. *Cytherella rugosa*, G. S. Brady, 1866 . Recent.
5. Suboblong. *Cytherella latimarginata*, G. S. Brady, 1880 . Recent.
6. Oblong. *Cytherella circumscripta*, Blake, 1876 . Lias.
7. Oblong. *Cytherella irregularis*, G. S. Brady, 1880 . Recent.
8. Oblong (narrow). *Cytherella?* *paupercula*, Blake, 1876 . Lias.

The species now about to be described can be arranged according to the grouping here adopted, as follows :

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|---|--|-----------------------|
| 1. <i>Cytherella valida</i> , nov., Pl. VI, f. 2. Oblong-ovate | } Surface
smooth;
profile more
or less
cuneiform | } Group I,
A, § 1. |
| 2. — <i>Benniei</i> , nov. { Pl. VI, f. 3, 4, 5, 7; } Suboblong | | |
| 3. — <i>recta</i> , nov., Pl. VI, f. 6, 11. Oblong | | |
| 4. — <i>concinna</i> , nov., Pl. VI, f. 9, 12. Long-oval | | |
| 5. — <i>hibernica</i> , nov., Pl. VI, f. 13. Ovate-oblong | | |
| 6. — <i>brevis</i> , Jones, Pl. VI, f. 8. Broad-ovate | | |
| 7. — <i>obliquata</i> , G. S. B., Pl. VII, f. 5. Oblong | | |
| 8. — <i>nuciformis</i> , Jones (Permian), Pl. VII, f. 14.
Subovate | | |

- | | | | | |
|-----|--------------|--|---|-----------------------|
| 9. | — | æqualis, nov., Pl. VI, f. 14, 15, 16. Oblong | } Surface
smooth ;
profile not
cuneiform,
but more or
less lanceo-
late or
narrow-oval | } Group I,
A, § 2. |
| 10. | — | Tatei, Jones, Pl. VII, f. 1. Ovate-oblong | | |
| 11. | — ? | inflata (Münster), Pl. VII, f. 2. Elliptical-ovate | | |
| 12. | — | simplex, J. & K., Pl. VII, f. 3. Elliptical | | |
| 13. | — | obesa, nov., Pl. VII, f. 10. Broad-subovate | | |
| 14. | — | sp. (undetermined), Pl. VII, f. 11. Elliptical-oblong ; profile ? | | |
| 15. | — | sp. (undetermined), Pl. VII, f. 13. Subelliptical | | |
| 16. | Cytherella ? | rotundata, nov., Pl. VII, f. 15. Broad-elliptical. Surface punctate ; profile not cuneiform. Group I, D ? | | |
| 17. | — | scrobiculata, nov., Pl. VI, f. 10. Oval-oblong. Surface transversely wrinkled ; profile cuneiform. Group I, C. | | |

Foreign species :

- | | | |
|-----|---|---|
| 18. | — | Benniei, var. Iowensis, nov., Pl. VI, f. 17. Elliptical. I, A, § 1. |
| 19. | — | — var. intermedia, nov., Pl. VII, f. 7. Subelliptical. I, A, § 1. |
| 20. | — | regularis, nov., Pl. VII, f. 6. Elliptical. I, A, § 2. |
| 21. | — | — var. nov., Pl. VII, f. 9. Elliptical ; profile ?. |
| 22. | — | subreniformis, nov., Pl. VI, f. 18. Elliptical-ovate. I, A, § 2. |
| 23. | — | sp. (undetermined), Pl. VI, f. 19. Elliptical. I, A, § 2 ?. |
| 24. | — | impressa, nov., Pl. VII, f. 8. Subelliptical. I, A, § 1. |
| 25. | — | Richteriana, nov. (Devonian), Pl. VII, f. 4. Suboval or ovate. I, A, § 2. |

In figuring the *Cytherella* we find it convenient to place the valves in an artificial position, with anterior end upwards (instead of to the right or to the left, as the animal would be when moving). Hence the *height* of the valves seems on the plates to be the *breadth*, and is so referred to sometimes in the text. The most convex of the two long margins is usually the ventral, and the muscle-spot, as a rule, is nearest to that edge.

1. *CYTHERELLA VALIDA*. Sp. nov. Plate VI, figs. 2 *a—c*.

Carapace rather large, ovate or suboblong, with unequally round ends, oblique on the front edge, neatly semicircular behind; compressed; rather more convex and somewhat narrower (lower) behind. Valves stout, smooth.

Length 1·4; height ·8; thickness ·56 mm. Proportions 35 : 20 : 14.

From the Mountain-limestone series at Calees, in East Cumberland. Collected by the Rev. Walter Howchin, F.G.S.

Some casts from near Carluke, collected by the late Mr. Grossart, Pl. VII, figs. 13 *a, b, c*, somewhat approach *C. valida* in size and outline.

2. *CYTHERELLA BENNIEI*, sp. nov. Plate VI, figs. 3 *a, b*; 4 *a, b*; 5 *a, b*; 7 *a, b*; and Plate VII, figs. 12 *a—d*.

Carapace mostly small, suboblong, rather variable, but higher (broader) behind than in front; edge-view sublanceolate, thickest in the posterior third, but slightly varying in individuals. Surface smooth.

	mm.	mm.	Proportions.
Length	1·04	·8	26 20
Height	·64	·4	16 10
Thickness	·48	·32	12 8

Fig. 3, from the Hosie Limestone, at the head of Mousewater,¹ Wilsontown, Lanarkshire, was collected by Mr. Bennie for the Geological Survey of Scotland.

Figs. 4 and 5, from the Carboniferous Limestone, Calderside, near High Blantyre,² were collected by Mr. John Young, F.G.S. Fig. 4 is rather more parallel-edged than the other.

Fig. 7, from the Carboniferous Limestone series (upper) of Kennoway Den, in Fife, is larger than the other examples of this species.³

¹ 'Catal. W.-Scot. Fossils,' 1876, p. 92. The geology of the Western Scotland is succinctly given by J. Armstrong, John Young, D. Robertson, and Dr. J. Young, in this valuable little book, which is an improved form of the Supplement of vol. iii, 'Trans. Geol. Soc. Glasgow,' 1871.

² 'Catalogue of the Western-Scottish Fossils,' 1876, p. 68.

³ We have examples of great difference in size among individuals of one species, from the Carboniferous Rocks, in the various representatives of *Leperditia Okeni*, from the Mountain-limestone and the Coal-measures. In the present case a larger variety than those here referred to is seen in the var. *Iowensis*, pl. vii, fig. 17, p. 80.

Fig. 12 of Plate VII is from a specimen collected by Mr. David Robertson, F.G.S., of Glasgow, from the Musselband-ironstone of the Swinehill Colliery,¹ near Stonehouse, Lanarkshire.

This species is named after Mr. James Bennie, Collector to the Geological Survey of Scotland, who has greatly aided ourselves and others in research among the Microzoa of the Carboniferous Rocks.

3. *CYTHERELLA RECTA*. Sp. nov. Plate VI, figs. 6 *a*, *b*; 11 *a*, *b*.

Carapace neatly oblong, with round ends, and straight, parallel ventral and dorsal edges, which, however, are sometimes rather incurved; profile more than half as thick as the height of the valves, slightly compressed anteriorly, and only slightly swollen posteriorly. Muscle-spot occasionally visible.

	mm.	mm.	Proportions.	
Length	·84	·76	21	19
Height	·48	·36	12	9
Thickness	·28	·28	7	7

Fig. 11, from the Hosie Limestone or Shale at the Head of Mousewater, near Wilsontown,² Lanarkshire (Geol. Survey Scotland), has an unusual swelling at the postero-ventral margin, but the force of this exceptional irregularity is overruled by the typical compression.

Fig. 6, also collected by the Geol. Survey of Scotland, is from the Upper Limestone Series, at Auchenberg,³ Lesmahago. It occurs also in shale of the Lower Limestone Series at Thornton,⁴ East-Kilbride district, Mr. D. Robertson's collection.

Reuss's *C. parallela*, in Haidinger's 'Abhandl.,' iv, pl. 6, fig. 1, is much like our *C. recta*, but is sharper in the profile anteriorly, and relatively fuller behind.

4. *CYTHERELLA CONCINNA*. Sp. nov. Plate VI, fig. 9 and figs. 12 *a*, *b*; figs. 19 *a*, *b*?

Carapace subovate, or rather long-ovate; smooth; profile bluntly lanceolate, narrowed in front, truncated behind. These two specimens, though not quite coinciding in outline, will scarcely bear parting. Fig. 12 is narrow-obovate, inasmuch as its front end is rather broader than the other. Fig. 19 possibly belongs to this species.

Length 1·16; height ·6; thickness ·44 mm. Proportions 29 : 15 : 11.

¹ 'Catal. W.-Scot. Fossils,' 1876, p. 90.

² Lower Limestone Series, 'Catal. W.-Scot. Fossils,' 1876, p. 92.

³ 'Catal. W.-Scot. Fossils,' 1876, p. 86. We have before now referred to *C. recta* from Auchenberg as '*C. parallela*, J. and K.," see the 'Explan. Sheet 31, Geol. Surv. Scotl.,' 1879, p. 83.

⁴ 'Catal. W.-Scot. Fossils,' 1876, p. 81.

Fig. 9, showing the smaller valve, and probably figured with the front end downwards, is among the specimens from East Kilbride, collected and mounted by the Rev. D. Ure, and preserved in the Hunterian Museum, at the Royal College of Surgeons, London.

Fig. 12 is a view of the larger valve of a *Cytherella* from the Mountain-limestone of Holwell,¹ Somerset, in the collection of the late Mr. Charles Moore, F.G.S., of Bath. The latter is comparable with Reuss's figure of *C. complanata*, 'Denksch. Akad. Wien,' vii, p. 140, pl. 28, f. 9, but it is longer in proportion.

5. *CYTHERELLA HIBERNICA*. Sp. nov. Plate VI, figs. 13 *a*, *b*.

Carapace-valve broad (high), subovate, one edge straighter than the other; much compressed; anterior border well-rounded, but rather obliquely; posterior almost truncate. Smooth; muscle-spot distinct. Profile narrow-lanceolate.

Length .76; height .44; thickness .24 mm. Proportions 19 : 11 : 6.

This compressed form is in a yellow shale of the Carboniferous Series of Ireland, from Cultra, on Belfast Lough, not far from Holywood. The locality and its strata are referred to in the 'Mem. Geol. Surv. Ireland, Explan. Sheets 37, 38, and 29,' 1871, pp. 10, 16. Also in the 'Ninth Annual Report Belfast Nat. Field-Club,' 1872, p. 35.

This *Cytherella*, associated with *Beyrichia multiloba* (?) and *Estheria tenella*, was kindly communicated by Mr. W. H. Baily, F.G.S. It may have been somewhat flattened by pressure, but its relative breadth (height) and extreme compression distinguish it from its Scotch ally *C. Bennici*, figs. 3—5, &c.

6. *CYTHERELLA BREVIS*, Jones. Plate VI, figs. 8 *a*, *b*.

CYTHERELLA BREVIS, Jones. Monthly Microsc. Journ., vol. iv, October, 1870, p. 185, pl. lxi, fig. 4; and vol. x, 1873, p. 75.

Carapace-valve broadly ovate, short; compressed, especially in front; smooth; rather straighter on one margin than on the other; ends round.

Length .76; height .56; thickness .24? mm. Proportions 19 : 14 : 6?

Collected by Mr. John Young, F.G.S., in the Campsie district,² in a calcareous rock, six feet above the Eurypterus-limestone, Lower Limestone Series.

¹ See 'Quart. Journ. Geol. Soc.,' xxxvii, p. 68.

² 'Catal. W.-Scot. Fossils,' 1876, p. 70.

7. CYTHERELLA OBLIQUATA, *G. S. Brady*, MS. Plate VII, figs. 5 *a—d*.

Carapace suboblong, or oblong with round ends, which are nearly but not quite equal in curvature; moderately convex, compressed forward and thick behind, giving an acute-ovate profile, and a suboval end-view. Surface smooth, marked with two oblique indentations in the antero-dorsal region.

Length .52; height .36; thickness .24 mm. Proportions 13 : 9 : 6.

From the Carboniferous Shales at Capelrig Quarry,¹ Lanarkshire. In Mr. D. Robertson's collection.

8. CYTHERELLA NUCIFORMIS, *Jones*. Plate VII, figs. 14 *a—c*.

CYTHERE (CYTHERELLA?) NUCIFORMIS, *Jones*. In King's Monogr. Perm. Foss., Pal. Soc., 1850, p. 64, pl. 18, figs. 11 *a—c*.

CYTHERELLA NUCIFORMIS, *Reuss*. Jahrb. Wetterauer Ges., 1854, p. 68, f. 9.

— — *Richter*. Zeitsch. deutsch. geol. Gesell., vol. vii, 1855, p. 529, pl. 26, figs. 8, 9.

CYTHERE — *Jones*. In Kirkby's Permian Entomostraca, Trans. Tyne-side Nat. Field-Club, vol. iv, 1859, p. 40, pl. 11, figs. 7 *a—c*.

— — *Geinitz*. *Dyas*, 1861, p. 31, figs. 1 *a—b*.

We include this little Permian species among the Carboniferous series, because of the intimate relationship of the fossils of the two formations. It has a subovate, smooth carapace, rather straighter on one edge than on the other; the profile is compressed-ovate, truncate posteriorly; end-view suboval, nearly round.

Length .28; height .16; thickness .12 mm. Proportions 7 : 4 : 3.

Permian: Byer's Quarry, Sunderland; and in Germany, near Hanau and near Saalfeld.

In King's 'Monogr. Permian Foss.,' p. 63, another doubtful species was referred to as "*Cythere (Cytherella?) inornata*, M'Coy;" and this has been quoted by Richter ('Zeitsch. d. g. Ges.,' vii, 1855, p. 529) as "*Cytherella inornata*, M'Coy," and by ourselves ('Trans. Tynes. F. Club,' iv, 1859, p. 160) as "*Cythere inornata*, M'Coy." We very much doubt if it be a *Cytherella*; and we are certain that M'Coy's "*Cythere inornata*" is a dwarf form of *Leperditia Okeni* (see 'Ann. Mag. Nat. Hist.,' ser. 3, vol. xviii, 1866, p. 44). Should this Permian species ultimately prove to be a *Cytherella*, it will stand as *C. inornata*, Richter.

¹ 'Catal. W.-Scot. Fossils,' 1876, p. 79.

9. *CYTHERELLA ÆQUALIS*. Sp. nov. Plate VI, figs. 14 *a, b*; 15 *a, b*; 16 *a, b*.

The carapace, as with *C. recta*, is smooth and oblong, with round ends, but it is nearly cylindrical; the dorsal and ventral edges vary a little in their parallelism and their compression. The edge-view differs from that of *C. recta* in being relatively thicker, and more equal at the ends, although the three examples figured vary among themselves. Fig. 14 *b* is compressed oval; fig. 15 *b* is subovate, compressed, and more convex posteriorly; and fig. 16 *b* has a marked medial convexity, but neither of its ends is acute.

Length ·6; height ·28; thickness ·24 mm. Proportions 15 : 7 : 6.

Fig. 14 is sketched from a specimen collected by Dr. H. B. Holl, F.G.S., in the Carboniferous Limestone of Great Orme's Head, North Wales. Another specimen, with a more cuneiform profile, and one much more convex, have since turned up in his collection.

Figs. 15 and 16 represent some specimens from the Upper Limestone Series at Gare,¹ near Carlisle, collected by Mr. John Young, F.G.S., of Glasgow.

10. *CYTHERELLA TATEI*, Jones. Plate VII, figs. 1 *a, b, c*.

CYTHERELLA TATEI, Jones. Proceed. Berwickshire Naturalists' Club, vol. x, 1884, p. 323, pl. 2, figs. 1 *a, b, c*.

Carapace-valves small, subovate, smooth, broad (high) in front, convex medially, but more compressed forward than behind. Breadth (height) equal to about two thirds of the length. Profile or edge-view lanceolate; end-view short-ovate.

Length ·72 (one specimen ·75); height ·46; thickness ·36 mm. Proportions 18 : 11½ : 9.

Collected by the late Mr. G. Tate, F.G.S., of Alnwick, in the Lower Mountain-limestone group at Lamberton, Berwickshire. In the Alnwick Museum.

11. *CYTHERELLA* ? *INFLATA* (Münster), Jones & Kirkby. Plate VII, figs. 2 *a, b*.

CYTHERE INFLATA, Münster. Jahrb. für Min., &c., 1830, p. 65, No. 17.

CYTHERELLA ? *INFLATA*, Jones & Kirkby. Ann. Mag. N. Hist., 1865, ser. 3, vol. xv, p. 408, pl. 20, figs. 8 *a—c*.

— — Jones & Kirkby. Trans. Geol. Soc. Glasgow, vol. ii, 1867, p. 218; and vol. iii, 1871, Supp., p. 28.

— — — — *A., Y., & R.* Catal. W.-Scot. Foss., 1876, p. 44.

— ? — *H. Woodward.* Catal. Brit. Foss. Crust., 1877, p. 109.

¹ 'Catal. W.-Scot. Fossils,' 1876, p. 73.

Carapace convex, broad-ovate, one edge rather straighter than the other; pinched anteriorly, convex medially and along the ventral region; gently compressed behind. End-view (of cast) inversely cordate. Muscle-spot distinct.

Length 1·4; height ·92; thickness ·64 mm. Proportions 35 : 23 : 16.

Casts of this form, which we still place under *Cytherella* with some doubt, are not common in the Carboniferous (marine) Shales of Craigen Glen,¹ Campsie, collected by Mr. John Young, F.G.S. It has also been collected by the Geological Survey of Scotland at Burniebrae Burn, near Shield's Farm, not far from Milton of Campsie; at Woodhall, Water of Leith, in a band of marine shale in the Cement-stone group; at Side old quarry, Midlothian; at the Salton Limeworks, new quarry, East Lothian, and at Sunnybank Quarry, near Inverkeithing. It occurs also in the Carboniferous Limestone of Visé, Belgium, and in that of Hof, in Bavaria.

12. *CYTHERELLA SIMPLEX*, Jones & Kirkby, MS. Plate VII, figs. 3 *a*, *b*.

CYTHERELLA SIMPLEX, J. & K. Trans. Geol. Soc. Glasgow, vol. ii, 1867, p. 218;
vol. iii, 1871, Suppl., p. 28.

— — *Armstrong, Young, & Robertson*. Cat. W.-Scot. Fossils, 1876,
p. 44.

— — *H. Woodward*. Cat. Brit. Foss. Crust., 1877, p. 110.

Carapace-valves broad-elliptical, slightly irregular on one margin; strongly convex in the middle, making an acute-elliptical profile. Smooth; muscle-spot distinct.

Length 1·12; height ·8; thickness ·64 mm. Proportions 28 : 20 : 16.

Collected by the late Mr. Grossart in the Lower Limestone Series of Scotland, 350 fathoms below the Ell Coal, Rae's Gill, near Carlisle.²

13. *CYTHERELLA OBESA*. Sp. nov. Plate VII, figs. 10 *a—c*.

Carapace small, subtrigonal-ovate, swollen on one margin, much less convex on the other. Surface smooth, almost uniformly convex, but fuller behind than in front. Profile narrow-ovate; end-view blunt-oval.

Length ·32; height ·24; thickness ·18 mm. Proportions 16 : 12 : 9.

From West Broadstone,³ in the Beith District, in West Scotland, where the Lower Limestone Series is very rich with Fossils.

14. *CYTHERELLA* (?). Sp. Plate VII, fig. 11.

This is the internal cast of a subelliptical, moderately convex valve, straight on one

¹ 'Cat. W.-Scot. Foss.,' 1876, p. 70.

² *Ibid.*, p. 75.

³ *Ibid.*, p. 67.

edge and symmetrically curved on the other; but not sufficiently characterised for a name.

Length ·44; height ·26; thickness ? mm. Proportions 22 : 13 : ?.

From the Mountain-limestone Shale of Wyebourne, near Penrith, Cumberland. Collected by Mr. Bland.

15. CYTHERELLA (?). Sp. Plate VII, figs. 13 *a—c*.

Of several casts, seemingly belonging to *Cytherella*, and obtained by the late Mr. Grossart (of Salsburg, near Holytown) from the Lower Carboniferous Beds, six feet above the Eurypterus Limestone of Lanarkshire, we here figure side-views of two valves and a profile of another. There is much variation as to ellipticity and marginal contour among the specimens, and no special character to enable us, after full consideration, to come to a definite conclusion as to the alliance of these carapace-valves. They seem to be closely related to *C. valida*, page 70. We have some like them from the Carboniferous Limestone of Belgium and elsewhere.

	mm.	mm.	Proportions.
Length	1·28	1·2	32 30.
Height	·68	·72	17 18.
Thickness	·4	?	10 ?

16. CYTHERELLA ? ROTUNDATA. Sp. nov. Plate VII, figs. 15 *a—c*.

Carapace broad-elliptical, uniformly convex, with greatest convexity central. Profile narrow-oval; end-view subovate. Specimens not well preserved; some apparently punctate.

Length ·64; height ·5; thickness ·34 mm. Proportions 32 : 25 : 17.

Collected by the Geological Survey of Scotland, at Mayfield Quarry, near Dalkeith. A specimen rather more ovate than fig. 15 *a*, and faintly punctate, was collected by Mr. D. Robertson, in the Lower Limestone Series, at Burnbank, Carlisle.¹

If this be a *Cytherella*, which is doubtful, it differs much from any common style of the genus, belonging, as it does, to Group I, B, punctate, *not cuneiform*.

17. CYTHERELLA SCROBICULATA. Sp. nov. Plate VI, figs. 10 *a—e*.

Carapace oval-oblong, broad (high), and stout, ends nearly equal, but somewhat variable. Profile narrow-ovate. Pit of the muscle-spot often visible. Surface ornamented

¹ 'Cat. W.-Scot. Foss.,' p. 71.

with a transverse wrinkly reticulation, of variable strength; the meshes sometimes strong, long, and with a tendency to be concentric; sometimes faint and scarcely discernible.

Length .84; height .6; thickness .44 mm. Proportions 23 : 15 : 11.

This is a rather common form. It occurs among the Carboniferous Entomostraca from East Kilbride,¹ in the Hunterian Museum (R. Coll. Surgeons), as collected and mounted by the Rev. D. Ure and given to John Hunter; also collected by Mr. D. Robertson, F.G.S., from the Upper Limestone Series at Williamswood,² near Glasgow; Brockley, Lesmahagow;³ Calderside⁴ Quarry, Lanarkshire; Calderwood,⁵ No. 1 limestone quarry; and Limekilns, East Kilbride; and at Robroystone,⁶ by Mr. John Young, F.G.S. Also, by the Geological Survey of Scotland, at Wilsontown⁷ (Head of Mousewater), in the Hosie Limestone; at Boghead, Hamilton,⁸ in shale between the limestones Nos. 1 and 2 of the Calderwood series; and on the River Avon,⁹ below Kinneil Mill, Linlithgowshire.

With reference to the preservation of some of the above-mentioned specimens (such as figs. 9 and 10 *a*) in the Hunterian Museum, we may mention that in 1793 the Rev. David Ure, of Rutherglen, noticed the existence of certain "microscopic bivalved shells" (Ostracoda) in the Carboniferous Limestones near Glasgow, and supplied his friends with suites of these little fossils, together with minute Gasteropods; and a tastily mounted set, in a glazed frame, is still preserved in the Hunterian Museum, Lincoln's Inn Fields. Another such set, now in the University Museum, Glasgow, was given to Dr. William Hunter. Four or five of these Ostracoda were figured and described by Ure in his 'History of Rutherglen and East Kilbride,' &c. (8vo, Glasgow, 1793). One of these (pl. 14, fig. 15), a small reniform *Cythere* (?), was found by him abundantly; another (fig. 20), a triangular *Bairdia* (apparently crushed, a condition in which, he says, they are sometimes found), was much scarcer, was obtained at Lawreston and Stuartfield, and in a limestone quarry, fifteen miles west of Newcastle-on-Tyne, near the spot where the Roman wall is intersected by Watling Street. Ure's figs. 16, 17, and 21 are *Beyrichia* and *Kirkbya*: these were the scarcest of all. Among the mounted specimens in the Hunterian Museum are distinguishable—*Cythere*, *Bairdia*, *Kirkbya*, and *Cytherella*,¹⁰ but, as they lie loose and crowded in their little cells, it is difficult to get at their exact features.

FOREIGN CARBONIFEROUS CYTHERELLÆ.

18. CYTHERELLA BENNIEI, var. IOWENSIS. Nov. Plate VI, figs. 17 *a*, *b*.

A very strong and large *Cytherella*, with thick, elliptical-oblong valves, compressed anteriorly, and swollen behind. It is much like *C. Benniei*, figs. 3, 4, 5, and 7, and

¹ 'Cat. W.-Scot. Foss.,' 1876, p. 78. ² Ibid., p. 92. ³ Ibid., p. 77. ⁴ Ibid., p. 68.

⁵ Ibid., p. 68. ⁶ Ibid., p. 88. ⁷ Ibid., p. 92. ⁸ Ibid., p. 82.

⁹ Ibid., p. 82. ¹⁰ *C. concinna* and *C. scrobiculata* of the present Monograph.

Pl. VII, fig. 12, but its posterior border is more neatly semicircular, and the proportional convexity and compression, as seen in the profile, are not exactly matched in the above-mentioned figures. We look on it as a local and large representative of the same species.

Length 1·16; height ·72; thickness ·56 mm. Proportions 29 : 18 : 14.

It is from the Upper Coal-measures of Iowa, United States of America, and is in Mr. D. Robertson's collection.

19. *CYTHERELLA BENNIEI*, var. *INTERMEDIA*. Nov. Plate VII, figs. 7 *a*, *b*.

This subelliptical carapace is simple in outline, and smooth, like many other *Cytherella*, and without any very distinctive characters. It comes near *C. Benniei*, though rather weak posteriorly—that is, narrower and more compressed behind than most of its Scotch congeners, and more so also than var. *Iowensis*. Smaller than the last mentioned, it is about as long (though not nearly so stout) as the individuals from Kennoway Den, Fife (Pl. VI, fig. 7). We will call it var. *intermedia*.

Length 1·0; height ·56; thickness ·4 mm. Proportions 25 : 14 : 10.

It is in Mr. D. Robertson's collection, and was got from the Upper Coal-measures of Iowa, U.S.A.

20. *CYTHERELLA REGULARIS*. Sp. nov. Plate VII, figs. 6 *a*, *b*.

Carapace elliptical in outline; narrow-oval in profile; almost symmetrical in the curves of both dimensions. Smooth; muscle-spot distinct, though faint.

Length ·76; height ·48; thickness ·32 mm. Proportions 19 : 12 : 8.

From the Fusulina-limestone of Iowa. In Mr. John Young's collection.

21. *CYTHERELLA REGULARIS*, var. ? Plate VII, fig. 9.

This symmetrically ovate carapace-valve, with relatively slight convexity, is from the Carboniferous Formation at Danville, Illinois, U.S.A., and was communicated by Professor McChesney. It may be a small variety of *C. regularis*, above described, from Iowa.

Length ·52; height ·32; thickness ? mm. Proportions 13 : 8 : ?.

22. CYTHERELLA SUBRENIFORMIS. Sp. nov. Plate VI, figs. 18 *a—c*.

These suboval, smooth carapace-valves are strikingly like the specimens figured by the late M. J. Bosquet, of Maastricht, from the Chalk of Holland and Belgium, first (1847) as *C. reniformis*, and subsequently (1854) as *C. ovata* (Roemer). The American specimens differ, however, in their less reniform shape and their more central convexity; the profile being lanceolate instead of narrow-ovate. Were these two sets of specimens found together, instead of being widely apart, both geologically and geographically, we should be inclined to regard them as varieties of one species; as it is, we prefer to make the most of their differences, and to call our figured specimens from Iowa *C. subreniformis*, having reference to the fact that the *Cytherella* above-mentioned, referred to *C. ovata* by M. Bosquet in 1854, was at first (in 1847) named by him *C. reniformis*, and being of opinion that it is far better to keep it distinct (as *C. reniformis*, Bosq.) from *C. ovata* (Roemer), with which it does not really agree.

Length 1·4; height ·64; thickness ·48 mm. Proportions 26 : 16 : 12.

C. subreniformis is from the Fusulina-limestone of Iowa, and is in Mr. J. Young's collection.

23. CYTHERELLA CONCINNA? (page 71). Plate VI, figs. 19 *a, b*.

Two carapace-valves (one imperfect), long-oval, almost truly elliptical (as far as the best, fig. 19 *a*, shows), occurred with figs. 18 *a—c* in the Carboniferous Limestone (Fusulina) of Iowa. It is hazardous to give this form a specific name without a better set of characters; but it is comparable with *C. concinna*, figs. 9 and 12.

Length 1·28; height ·64; thickness ? mm. Proportions 32 : 16 : ?.

24. CYTHERELLA IMPRESSA. Sp. nov. Plate VII, figs. 8 *a, b*.

Carapace subelliptical, faintly curved on the dorsal and ventral margins; round in front, subangular behind; smooth. Profile cuneiform, sharp anteriorly, thick posteriorly, and indented on each side by the deep muscle-spot.

Length ·92; height ·48; thickness ? mm. Proportions 23 : 12 : ?.

This differs from the other Iowa specimens, and approaches in form some of the small Scotch varieties of *C. Benniei*, but its posterior margin is too angular for any of them.

This is from the Fusulina-limestone of Iowa, and is in Mr. John Young's collection.

25. *CYTHERELLA RICHTERIANA*. Sp. nov. Plate VII, figs. 4 *a—e*.

These Devonian specimens, from the so-called "Cypridinen-Schiefer" of Saalfeld, were given to us by Prof. Dr. R. Richter some years ago. Pressure may have modified the outlines somewhat, and rendered figs. 4 *a* and 4 *d* more ovate than the oval specimen fig. 4 *c*. The profiles of two different valves give a central convexity. The characteristic flange of the left valve is shown in fig. 4 *e*. Taking them together, as showing probable variations of form in an old and much squeezed rock, we call them *C. Richteriana*, after our well-known friend, the assiduous palæontologist of Saalfeld. They are related apparently to *C. simplex* (Pl. VII, fig. 3), but they have not the ellipticity, nor the relative convexity, of that form. On account of their similarity to *C. simplex* we include these *Devonian* specimens in our Monograph, remembering also that the "Devonian" Fauna and Flora are closely related to those of the "Carboniferous" period.

	mm.	mm.	mm.	mm.	Proportions.				
Length	·96	1·0	1·08	·7	.	24	25	27	17½.
Height	·7	·68	?	·48	.	17½	17	?	12.
Thickness	·44	?	·72	?	.	11	?	18	?

Besides the localities mentioned with the foregoing descriptions of Carboniferous *Cytherellæ* we have noted the following in Scotland as yielding species of simple forms, such as *C. Benniei*, *C. recta*, and *C. simplex*, but not yet determined. In the collection of the Geological Survey of Scotland:—Ponfeigh Burn, near Douglas ('Cat. W.-Scot. Foss.,' p. 77); Climpy Limestone, near Climpy, Wilsontown (ib., p. 92); Mountainblaw, Wilsontown; Hillhead quarry, Wilsontown (ib., p. 74); Limekilns, old quarry adjoining Limekilns House, near East Kilbride, Lanarkshire, from shale between limestones Nos. 1 and 2 of the Calderwood series (ib., p. 80); Whitefield, old quarry, Peeblesshire; and shales of the Calciferous Sandstone series, north of New Castleton, Roxburghshire. In 1871 Mr. John Henderson, of Edinburgh, noticed one or more *Cytherellæ* in the strata on the west side of Craig-Lockhart Hill, three miles south of the village of Currie, Pentland Hills.

ADDENDUM TO THE CYPRIDINADÆ. (See page 43).

2. *PHILOMEDES ELONGATA*. Sp. nov. Plate VI, figs. 1 *a, b, c*.

Carapace-valve elongate, depressed; long-oblong; straight dorsal, and rather convex ventral margin, with one end (posterior) elliptically rounded, the anterior truncate and hooked, the straight dorsal margin being produced into a large blunt hook, overhanging a deep open notch, which reaches upwards for about four fifths of the height of the valve. The postero-ventral ellipticity gives the outline the shape of a broad knife-blade. If compressed by embedment in the shale, this carapace may have been subcylindrical originally.

The length, including the hook, is 6 millimètres; the hook is about $\frac{1}{10}$ th of the whole length; the greatest height of the valve is $2\frac{1}{2}$ mm.

The surface that remains shows numerous conspicuous radiate markings, analogous to those seen in *Cypridina radiata*, J. and K., p. 14, Pl. V, figs. 6 *d, e*; also in some Beyrichian casts, from the Carboniferous strata in Dumfriesshire, which belong to *B. gigantea*, J. and K., Pl. IV, figs. 27, 28. These radiate spots appear to have some relation to the radiate tops of the transverse columns, dividing the blood-canals in the mantle or investment of the test of *Estheria*, as described and illustrated by E. Grube, 'Wiegmann's Archiv für Naturgesch.', 1865, p. (15) 217, pl. 10, figs. 7 and 11.

This unique specimen was found by Mr. Edward Wilson, F.G.S., of Nottingham, on the pit-bank of the Claycross Company's Colliery at Claycross Station, about five miles south of Chesterfield, Derbyshire. Mr. Wilson observes that "this colliery works the Black Shale or Silkstone Seam, the bed of coal which the Geological Survey places at the base of the Middle Coal-measures, dividing that series from the Lower or Gannister series. There can be little doubt that the specimen came from the *bind* (shaly sandstone) that forms the roof of that (Silkstone) seam. Therefore its horizon is the base of the Middle Coal-measures."

This remarkable Cypridinad, though so narrow and compressed, seems to be nearer in its form to *Philomedes* than to any other of the *Cypridinadæ* (see pp. 4, 8, and 43).

CARBONIFEROUS ENTOMIDIDÆ.

ENTOMIDIDÆ, Jones, 1870. Month. Microsc. Journ., vol. iv, p. 187.

— — 1873. Ann. Mag. Nat. Hist., ser. 4, vol. xi, p. 417.

Under the heading ENTOMIDIDÆ two genera, *Entomis* and *Entomidella*, have been grouped on account of their extremely developed nuchal furrow, thus standing apart from the other known Ostracoda, recent and fossil. They differ from those Cypridinads which have a nuchal furrow by the absence of a frontal notch.

In 1870¹ *Entomis* and *Entomidella* were included with the *Cypridinadæ*, but in 1873² they were separated off as a distinct group—*Entomididæ*—on account of the intensity of their dorsal sulcus, the absence of frontal sinus and hook, and their more or less *concentric* ornament. It was the apparent similarity of the transverse ridging in *Entomis Koninckiana* and *E. Burrovi* (Plate IV, figs. 20 and 21) to that in some *Cyprellæ*, shown in the same plate, that led to the collocation of these forms on that Plate. The real difference, however, in the ridging (that of *Cyprella* being discontinuous, whereas that of *Entomis* is continued by curvatures on the ventral region) was soon recognised, and these *Entomididæ* have had to remain undescribed until the PLATYCOPA were treated of in their right place.

The *Entomididæ* are more closely related to some members of the *Leperditiadæ*³ than to any other known genera. Their deep dorsal or nuchal furrow is an exaggeration of that in *Primitia*, *Beyrichia*, and *Kirkbya*. Indeed, there is a faint trace of it in *Leperditia* and *Isochilina*. The plan of concentric ridging is present also in some *Kirkbyæ*. Hence we think that provisionally we may place the *Entomididæ* close to the *Leperditiadæ*. As some good Carboniferous species have been figured in Plate IV we proceed to describe them.

ENTOMIS, Jones, 1861.

1841 and 1844 Cypridina (in part), De Koninck, Nouv. Mém. Acad. Roy. Sci. et Belles Lettres de Bruxelles, vol. xiv, 1841, Mém. Crust. foss. Belg., p. 18; Descript. Anim. foss. Carb. Belg., 1844, p. 587.

¹ 'Monthly Microsc. Journ.,' vol. iv, 1870, p. 187.

² Ibid., vol. x, 1873, p. 77.

³ Ibid., vol. iv, p. 187.

- 1842 Cytherina, G. Sandberger, Neues Jahrb. für Min., &c., Jahrg. 1842, p. 226.
- 1845 Cypridina, G. Sandberger, Jahrb. Vereins für Nat. Nassau, Heft ii, pp. 121, 123.
- 1848 — (in part), H. G. Bronn, Index Palæontol., i, p. 387; ii, p. 559.
- 1848 — Richter, Beitrag zur Paläontol. der Thüringer-Waldes, p. 19.
- 1850 — G. and Frid. Sandberger, Verst. rhein. Schicht. in Nassau, p. 4.
- 1852 — Bronn and Roemer, Lethæa Geognost., 3rd edit., vol. i, part ii, p. 531.
- 1854 — (in part), Pictet, Traité de Paléontol., 2nd edit., vol. ii, p. 535.
- 1854 — F. A. Roemer, Palæontographica, vol. iii, pp. 19, 28, 42, 111.
- 1856 — Richter, Beitrag, &c., Denksch. math.-nat. Cl. k. k. Akad. Wien, vol. xi, p. 121.
- 1861 Entomis, Jones, Mem. Geol. Survey Gt. Brit., Geol. Edinburgh (Explan. Map 32), p. 137.
- 1863 and 1864 Entomis, Jones and Kirkby, Geologist, vol. vi, 1863, p. 460; Rep. Brit. Assoc. Newcastle-on-Tyne, for 1863, 1864, Trans. Sect., p. 80; Neues Jahrb. f. Min., &c., Jahrg. 1864, p. 54; Canad. Nat. Geol., n. s., vol. i, p. 237.
- 1866 Cypridina, F. A. Roemer, Verst. Harzgeb., &c., Palæontogr., vol. xiii, Lief. v, pp. 226 and 232.
- 1868 Entomis, Bigsby, Thesaurus Siluricus, p. 74.
- 1869 Cypridina, Ludwig, Neues Jahrb. f. Min., &c., Jahrg. 1869, p. 674.
- 1869 — Richter, Zeitsch. deutsch. geol. Ges., vol. xxi, pp. 390, 391, 757, &c.
- 1869 and 1870 Entomis, Jones, Palæoz. Brit. Entom. (Geol. Assoc., 1869), pp. 2 and 5; Monthly Microsc. Journ., vol. iv, 1870, pp. 185, 187.
- 1872 Entomis, Barrande, Crustac. Poiss. Silur. Bohême (Extrait, &c.), p. 41; Système Silur. Bohême, vol. i, Supplément, p. 512.
- 1873 — Jones, Notes on the Pal. Biv. Entom., x (*Entomis* and *Entomidella*), Ann. Mag. Nat. Hist., ser. 4, vol. xi, p. 413.
- 1874 Richteria, Jones, Neues Jahrb. f. Min., &c., Jahrg. 1874, p. 180.
- 1874 Entomis, Jones, Trans. Geol. Soc. Edinburgh, vol. ii, p. 322; Geol. Magaz., decade ii, vol. i, p. 511.
- 1878 — Gümbel, Kurze Anleit. geol. Beob. Alpen, p. 97.
- 1878 Cypridina, Entomis, et Richteria, Bigsby, Thesaurus Devonico-Carboniferus, pp. 26, 27, 249.
- 1879 Entomis, Jones, Pal. Biv. Entom., xiii, Ann. Mag. Nat. Hist., ser. 5, vol. iv, p. 182.
- 1879 — Jones, Nicholson and Etheridge's Monogr. Silur. Fossils Girvan, fasc. ii, p. 223.

- 1881 *Entomis*, Jones, Geolog. Magaz., dec. ii, vol. viii, p. 341.
 1883 — Jones, Ann. Mag. Nat. Hist., ser. 5, vol. xii, p. 245.
 1884 — J. M. Clarke, Neues Jahrb. f. Min., &c., Jahrg. 1884, i, p. 184.

ENTOMIS has a bivalved, convex carapace, sub-oblong, ovate-oblong, fabiform, amygdaliform, or subreniform; and is more or less constricted dorsally by a transverse furrow across the hinge-line. This impression, beginning on each valve at or in front of the middle, is continued across its surface to the hinge-line, usually with a slight curvature. In front of the sulcus there is sometimes a rounded tubercle; but this is variable in position and shape; sometimes it is a spine, sometimes it is wanting. In *Entomis tuberosa*, a radiate muscle-spot, somewhat like that of *Leperditia*, in connection with the tubercle, is shown on some internal casts in Silurian mudstone from the Pentland Hills, Scotland (Messrs. Haswell and Brown's collections).

The surface of the valves may be either smooth, or ornamented with raised lines or delicate riblets, arranged in a definite pattern,—transverse, longitudinal, or concentric, and sometimes associated with minute spines or prickles.

The anterior margin is not indented with any sinus or notch; and is therefore without beak or hood.

This beakless and transversely sulcate form is, as above stated, of uncertain alliance. It approximates to some of the beaked Cypridinads (*Cyprella* and *Cypridella*) in having a nuchal furrow (which is, however, traceable in many other Palæozoic bivalved Entomostraca) and sometimes a sub-median knob; but the former is usually very strongly marked in *Entomis*, and the latter is very variable. In some species the sculpturing of the valves distantly resembles the annular ornament seen in *Cyprella* (compare figs. 13 and 21, Pl. IV); but usually it is quite distinct.

As far as the shape of the carapace is concerned, *Entomis* stands in the same relation to *Cypridella* and *Cyprella* of De Koninck, as *Polycope* of Sars to *Cypridina* of Milne-Edwards, the anterior notch having disappeared in both *Polycope* and *Entomis*. The animals, however, may have respectively differed very much; for *Polycope* and *Cypridina* belong to different families, and the deep nuchal furrow in *Entomis*, far more impressed than in *Cypridella* and *Cyprella*, was probably in direct relation with the structure of its internal organs, under modifications not present in other genera.

The physiological meaning of the nuchal furrow in these Entomostraca is not understood. Among recent forms it is faintly indicated in *Philomedes* and *Halocypris*; it is stronger in *Pleopsis* and *Daphnella*, belonging to quite another group of Entomostraca.

1. ENTOMIS CONCENTRICA (*De Koninck*), 1841. Pl. IV, figs. 22, 25*a*, 25*b*.

CYPRIDINA CONCENTRICA, *De Koninck*, 1841. *Nouv. Mém. Acad. Roy. Brux.*, vol. xiv, p. 18, fig. 10; 1844, *Descript. Anim. foss. Terr. Carb. Belg.*, p. 587, pl. 52, figs. 4, 5.

CY THERE CONCENTRICA, *Dupont*, 1863. *Bull. Acad. R. Sc. Brux.*, sér. 2, vol. xv, p. 110.

ENTOMIS — *Jones and Kirkby*, 1864. *Neues Jahrb. für Min., &c.*, Jahrg. 1864, p. 54; *Canad. Nat. Geol.*, n. s., vol. i, p. 237.

This Belgian species has an oblong carapace with rounded ends, like a haricot-bean. The lower margin has an elliptical curvature in Prof. L. De Koninck's fig. 5, but is nearly straight in our fig. 25*a*.

	mm.	mm.	Proportions.	
Length	6·25	5·25	.	25 21
Height	3·5	3	.	14 12
Thickness	3	2·5	.	12 10

Each valve is sculptured with concentric elliptical lines, like the minute plicæ or ridges of the skin on the inside of the human finger-top. These delicate wrinkles, however, are interrupted by the strong transverse sulcus near the middle of the valve, so that the hinder moiety of the surface has a complete and nearly horizontal pattern of elliptically concentric rugæ, and the lowest or most ventral of these curve forward and upward on the anterior moiety of the valve, and converge on its antero-dorsal margin, where the sulcus or nuchal furrow begins.

The specimens here figured were given to us by our friend the late M. J. Bosquet, of Maastricht, well known for his palæontological researches in Holland and Belgium.

Fig. 22 is a cream-coloured carapace; and figs. 25*a*, 25*b*, represent a yellowish-grey internal cast, showing a strong sulcus, and retaining a faint trace of the external ornament. Fig. 22 gives a dorsal view (in outline) of the two valves, opened, but still touching along the hinge-margin.

This species is said to be very rare in Belgium. We have not met with it in Britain.

2. ENTOMIS BICONCENTRICA, *Jones*, 1870. Pl. IV, figs. 23*a*, 23*b*, 26*a*, 26*d*.

ENTOMIS BICONCENTRICA, *Jones*, 1870. *Monthly Microsc. Journ.* for October, 1870, vol. iv, p. 185, pl. lxi, figs. 13 *a*, *b*.

This is also fabiform, oblong in outline with rounded ends; and it has a strong sulcus, as in *E. concentrica*. Its sculpturing, however, though of the same character,

differs by the posterior elliptical rings of rugæ being less truly horizontal, and by the anterior rugæ, after sloping upwards and outwards halfway up the valve, turning back on themselves towards the sulcus, in the front half of the valve, and thus forming another but smaller, and still more oblique ellipse of concentric lines.

Length 6·25 ; height 3·5 ; thickness 3·5 mm. Proportions 25 : 14 : 14.

Fig. 26, taken from one of the black carapaces found in the Carboniferous Limestone of Little Island, Cork, by Joseph Wright, Esq., F.G.S., shows all the features very clearly, including the rugæ and the coarsely reticulate pitting of the surface of the valves.

E. biconcentrica has also been found in the Carboniferous Limestone Series near Carluke.

The ornament of *E. concentrica*, and especially of *E. biconcentrica*, has some analogy to that of the Silurian *E. migrans* (Barrande, 'Syst. Sil. Bohême,' vol. i, Suppl., pp. 514 and 515, pl. xxiv, figs. 10—14), inasmuch as the last has longitudinal wrinkles or riblets curving along the ventral edge, and turned back on themselves in the upper part of each moiety of the valve. They make, however, two nearly equal concentric triangular patterns (not always regular) instead of elliptical curves. The rugæ also seem to be coarser, and the valves are shorter and rounder, with semicircular ventral, and deeply indented dorsal margin.

Barrande's *E. dimidiata* (op. cit., p. 513) also has traces of somewhat similar but very delicate riblets.

A little thickening on the anterior edge of the sulcus is visible in M. Barrande's figs. 11 and 13, and also in our drawing of *E. Burrovii* (fig. 21); and this may represent the large tubercle in the *Cyprellæ* and *Cypridellæ*; also that in our *Entomis obscura*, in *E. pelagica*, Barr., and *E. tuberosa*, Jones, as well as the spine in *E. aciculata* Jones. The last three are Silurian.

There is a strong resemblance in the ornamentation of the Carboniferous Entomids with that of some of the Devonian species, formerly known as "Cypridinæ" (alluded to also by M. Barrande, op. cit., p. 515). A reference to the 'Annals Nat. Hist.' for September, 1879, p. 187, pl. ii, figs. 11 and 12, will show that the Devonian forms there figured and described as *Entomis gyrata* (Richter) have longitudinal riblets bent sharply on themselves at each extremity, and cut into two by the vertical sulcus so as to leave a concentric group on each moiety of the valve.

3. ENTOMIS BURROVII. Sp. nov. Plate IV, figs. 21 a—c.

Fig. 21 shows fully the characters and features of a fine *Entomis* from Settle, West Yorkshire. This is a dark-grey left valve, nearly oblong, truncate behind, rounded in

front, and deeply impressed with the dorsal (nuchal) sulcus, slightly in front of the centre. The posterior moiety bears about eleven vertical, somewhat sinuous, parallel riblets, curving forwards along the ventral region, and fading out forwards as they slope upwards over the anterior portion of the valve. The hinder moiety is rather larger than the other.

Length 6·25 ; height 3·75 ; thickness 3·5 mm. Proportions 25 : 15 : 14.

This, one of the best of the excellent specimens collected by the late Mr. J. H. Burrow at Settle, we named in 1874 (Explanation of Plate IV) in compliment to him, and we regret that in consequence of his death we have now to regard it only as a memorial of his enthusiastic attachment to geology.

4. ENTOMIS KONINCKIANA. Sp. nov. Plate IV, figs. 20 *a—c*.

This well-marked *Entomis* is oblong, with unequal ends, a deep medial sulcus, and comparatively few but distinct costulæ. There are about six, vertical and parallel on the posterior half, some of which curve along the ventral region, and slope up thence towards the antero-dorsal margin (imperfect in this specimen). The front moiety of the valve is rather more convex than the other.

Length 5·25 ; height 3 ; thickness 3 mm. Proportions 21 : 12 : 12.

This is a light-grey valve in the whitish limestone of Settle, West Yorkshire, and as it is well worthy of distinction we dedicate it to our esteemed friend, the eminent and veteran palæontologist, Prof. Dr. L. de Koninck, who first recognised and described many of the Entomostraca of this interesting group in the Carboniferous Limestone of Belgium.

5. ENTOMIS OBSCURA. Sp. nov. Plate IV, figs. 19 *a—d*, 24.

Fig. 19 represents a smooth but weathered or partly dissolved valve, grey like its matrix of limestone, from Cork, Ireland. Its surface is not so distinctly reticulate as the figure appears to be. The valve is oblong, rounded anteriorly, and somewhat obliquely truncate behind. It has a submedial dorsal furrow, and a large tubercle on the front half, but the hinder moiety is rather larger and more convex than the other.

Length 6·25 ; height 3·75 ; thickness 3·25 mm. Proportions 25 : 15 : 13.

Fig. 24 is drawn from a ferruginous internal cast of a similar *Entomis*, in grey limestone from Settle, West Yorkshire. It is not well preserved, the ventral margin being damaged.

This differs sufficiently from other known forms to be regarded as distinct. On account, however, of its rather feeble characterisation we have termed it *E. obscura*.

NOTES ON PL. IV, FIGS. 27 AND 28, AND PL. VII, FIGS. 16 AND 17.

The above-mentioned figures do not belong to Cypridinads nor Cytherellids, but were introduced into the Plates by inadvertence.

1. The specimens, figs. 27 and 28 (*Beyrichia gigantea*) in Pl. IV, having been found with the *Cypridinads* in the Mountain-limestone at Longnor, in Derbyshire, and at Cork, in Ireland, were sketched in as associates. They are remarkable for their size.

They have the three lobes, marginal rim, and outline of Beyrichian valves. The posterior lobe is the largest (to the right hand in fig. 27, and on the left in fig. 28) as usual. The middle lobe is rather larger (relatively) than in some of the known species of *Beyrichia*; and the three lobes are not so deeply divided by valleys as in many cases.

Fig. 27 shows a somewhat damaged left valve ($\frac{1}{6}$ inch long) in grey Upper-Carboniferous Limestone, from Parkhill, near Longnor, Derbyshire, now in the Museum of the Geological Survey at Jermyn Street, on Tablet $\frac{3.8}{1.4}$. Fig. 28 is a larger, but badly preserved right valve, still embedded in the light-grey Limestone of Cork, and collected by Mr. Joseph Wright, F.G.S. Mr. J. R. J. Hunter has found an imperfect cast of *B. gigantea* in the Mainpost Limestone at Braidwood, near Carluke.¹

The relatively large size gives origin to the name that we have proposed for this species.

	mm.	mm.		Proportions.
Length	4·2	5·2	.	17 21
Height	3·2	3·5	.	13 14
Thickness	3·	?	.	12 ?

Numerous specimens of a similar form, occurring on a black Lower-Carboniferous shale from Eskdale, Dumfriesshire, are in the British Museum. Some have the valves united, but lying open; and in one, at least, a radiated structure of the valves much like that in *Cypridina radiata*, Pl. V, figs. 6 *d, e, f*, and *Philomedes elongata*, Pl. VI, figs. 1 *a, b, c*, is clearly indicated. The *radiate* structure of fossil Entomostracan valves is shown also in E. O. Ulrich's *Leperditia radiata*, from the Lower Silurian strata (Utica Slate) near Cincinnati, Ohio, U.S. (see 'Journ. Cincin. Soc. Nat. Hist.,' vol. ii, 1879, p. 2, pl. 7, figs. 2 *a, b*). This small form looks like a simple *Primitia*.

2. Pl. VII, figs. 16 *a, b, c*, represent a form which was at first taken for a *Cytherella*; but the want of dorsal overlap, and the presence of a transverse hollow, shallow as it is, which in other specimens becomes a marked depression and foreshadows the sulcus seen

¹ 'Catal. Western-Scottish Fossils,' 1876, p. 71.

in *B. arcuata* and its congeners, correct the first impression. We leave this passage-form of weak Beyrichian alliance for further observation.

The specimen figured has a length $\cdot 88$; height $\cdot 48$; thickness $\cdot 4$ mm. (proportions 22 : 12 : 10); and is from the Axinus-bed in the Lower Carboniferous of Randerstone, Fifeshire.

3. Pl. VII, figs. 17 *a, b, c*, was drawn at first as an abnormal *Entomis*, owing to its concentric ornament and central depression; but the latter, more like that in *Kirkbya*, is not equal to the deep transverse sulcus of *Entomis* (see Pl. IV, figs. 20, 21, 26); and the ornament resembles that of *Kirkbya costata*, M'Coy.¹

The specimen is in length 1.28; height $\cdot 68$; thickness $\cdot 72$ mm. (proportions 32 : 17 : 18), and is from Brockley, Lesmahagow, Mr. D. Robertson's Collection.

¹ 'Annals Mag. Nat. Hist.,' ser. 3, vol. xviii, 1866, p. 43.

ERRATA ET CORRIGENDA.

Page 9, line 6 from bottom, *for* 1855, *read* Proceed. Amer. Acad., ii, pp. 51—53, 1852.

„ 11. *Add to Synonyms:*

CYPRIDINA (including some *Cytheræ*, &c.), *Bronn*. Leth. geogn., i, p. 38, Table, 1851.

— (including *Entomis*, &c.), *Bronn*. Leth. geogn., 2nd edit., p. 531, 1852.

„ 12. *Add to Synonyms:* DAPHNIA ? PRIMËVA, *M'Coy*. Ann. Mag. Nat. Hist., 2, iv, p. 395, 1849.

„ 20. CYPRIDINA OBLONGA, as figured at Pl. V, fig. 12, is probably imperfect at the beak, as shown by a better specimen with a long beak like that of *C. brevementum*.

„ 23. CYPRIDINELLA BOSQUETI has been found at Middleton, in the Carboniferous Limestone, near Cork, by Mr. Joseph Wright, F.G.S.

„ 38. *Add to Synonyms:*

CYPRELLA CHRYSALIDEA, *Bronn* (*Römer*). Lethæa geogn., vol. i, part 2, p. 533, t. 9³, f. 11, 1852.

„ 42, line 15 from bottom, *for* 53, *read* 54.

„ 49. *Add to Synonyms:*

ENTOMOCONCHUS SCOULERI, *Bronn* (*Römer*). Leth. geogn., vol. i, part 2, p. 534, t. 9³, f. 14, 1852.

— *Jones*. Palæoz. Biv. Entom., Proc. Geol. Assoc., 1869, pp. 2, 5.

„ 53, line 8 from top, *for* F, fig. 2, *read* F, f. 2.

„ 54. POLYCOPE.

In the palæontological portion of “The Yorkshire Lias,” by R. Tate and J. F. Blake, 1876, the latter has noted, at page 434, that the Carboniferous species which we have referred to *Polycope* appear to him “to belong to a different family, and only to bear an accidental resemblance to *Polycope* in their simplicity.” This resemblance being due possibly to homoplasy and not to homogeny, Prof. Blake suggests (in letter) that it is not advisable to refer these Carboniferous forms to a member of the *Cladocopa* rather than to the *Myodocopa*, of the former of which (excepting Mr. Blake’s liassic species) only recent and post-tertiary examples are known. Our friend’s suggestion is doubtless well-founded. It may be too bold to suppose that this special section of Ostracods had been already separated off at that early period (Carboniferous), and that a few forms, among a number of others very similar to them, alone represented this section; and perhaps we ought to have kept them among the *Cypridinadæ*, with a distinct name. So many, however, of the fossil bivalve Entomostraca, even of Silurian age, seem to correspond with known recent *genera* of various alliances, that it seems scarcely strange to find some palæozoic members of even a limited and rare section. At all events, we must leave the question open for the present.

Explanation of Plate V. Fig. 6 *d* is magnified 80 diameters.

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N.B.—Names in *Italics* are Synonyms.

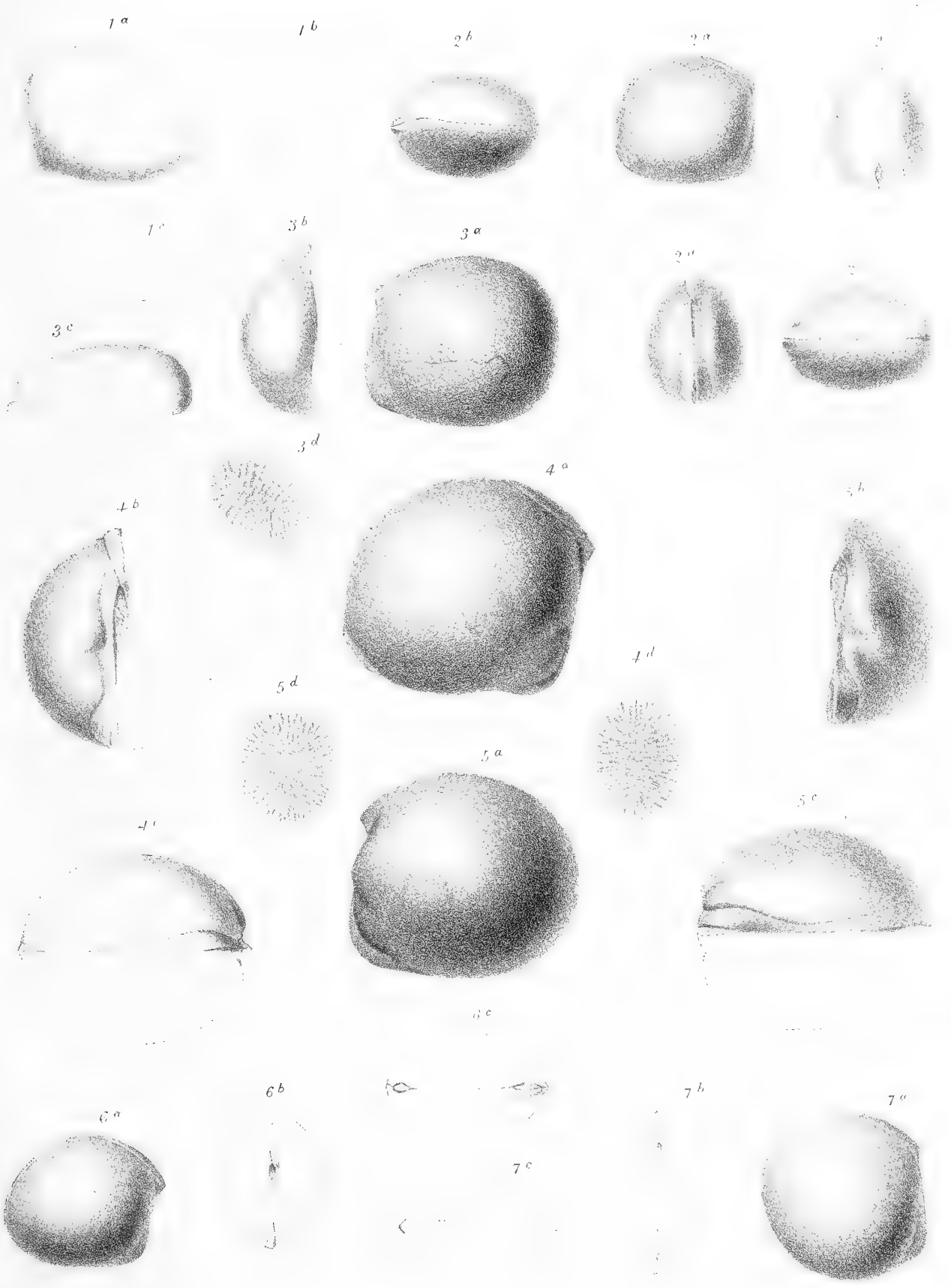
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<i>Cythere annulata</i>	40	Entomis	82
— <i>concentrica</i>	85	— <i>biconcentrica</i>	85
— <i>Edwardsiana</i>	32	— <i>Burrovii</i>	86
— <i>Phillipsiana</i>	49	— <i>concentrica</i>	85
Cytherella	6, 10, 57, 65	— <i>Koninckiana</i>	87
— <i>æqualis</i>	69, 74	— <i>obscura</i>	87
— <i>Benniei</i>	68, 70	Entomoconchidæ	5, 10
— — <i>var. intermedia</i>	69, 78	Entomoconchus	5, 45
— — <i>var. Iowensis</i>	69, 77	— <i>globosus</i>	52
— <i>brevis</i>	63, 65, 68, 72	— <i>orbicularis</i>	52
— <i>concinna</i>	68, 71, 79	— <i>Scouleri</i>	49
— <i>Hibernica</i>	68, 72	— <i>sp. nov. ?</i>	52
— <i>impressa</i>	69, 79	Eurypylus	4, 9
— ? <i>inflata</i>	58, 62, 66, 69, 74	Halocypris	5, 10
— <i>Murchisoniana</i>	63, 66	Heterodesmus	5, 10
— <i>nuciformis</i>	60, 62, 68, 73	<i>Kirkbya costata ?</i>	89
— <i>obesa</i>	69, 75	<i>Myodocopa</i>	3
— <i>obliquata</i>	68, 73	<i>Offa</i>	53
— ? <i>ovalis</i>	62, 66	— <i>Barrandiana</i>	53
— <i>recta</i>	68, 71	Ostracoda	3
— <i>regularis</i>	69, 78	<i>Philomedes</i>	4, 8, 43, 81
— — <i>var. ?</i>	69, 78	— <i>Bairdiana</i>	4
— <i>Richteriana</i>	69, 80	— <i>elongata</i>	81
— ? <i>rotundata</i>	69, 76	<i>Platycopa</i>	6, 57
— <i>scrobiculata</i>	69, 76	<i>Podocopa</i>	3
— <i>simplex</i>	62, 69, 75	<i>Polycope</i>	6, 10, 54, 90
— ? <i>sp.</i>	68, 75	— <i>Burrovii</i>	54
— <i>sp. (? concinna)</i>	69, 79	— <i>simplex</i>	54
— ? <i>sp. (? valida)</i>	69, 76	— <i>Youngiana</i>	56
— <i>subreniformis</i>	69, 79	<i>Rhombina</i>	43
— <i>Tatei</i>	66, 69, 74	— <i>Belgica</i>	44
— <i>valida</i>	68, 70, 76	— <i>Hibernica</i>	44
Cytherellidæ	6, 10, 57	<i>Sulcuna</i>	36
<i>Cytherellina</i>	57	— <i>cuniculus</i>	37
Cytheridæ	3	— <i>lepus</i>	36
<i>Cytherina Phillipsiana</i>	49		

PLATE I.

FIG.

- 1 *a—c.* *Entomoconchus Scouleri*, M'Coy, *var. ovalis*, nov. A cast from Meath, Ireland. (Page 49.)
a, Side-view of the left valve; *b*, hinder view; *c*, back-view. Magnified 4 diameters.
- 2 *a—e.* *Entomoconchus Scouleri*. Small female (?) shell. From Settle, Yorkshire. (Page 50.)
a, Profile, showing right valve; *b*, dorsal view; *c*, posterior; *d*, anterior; *e*, ventral. Magnified 4 diameters.
- 3 *a—d.* *Entomoconchus Scouleri*. Cast with portion of the shell. From Visé, Belgium. (Page 50.)
a, Profile, showing left valve; *b*, hinder end of the valve; *c*, ventral edge; magnified $2\frac{1}{2}$ diameters. *d*, Muscle-spot as shown on the cast; magnified 12 diameters.
- 4 *a—d.* *Entomoconchus Scouleri*. Large specimen from Bolland, Yorkshire. (Page 51.)
a, Profile, showing right valve; *b*, anterior; *c*, ventral; magnified $2\frac{1}{2}$ diameters. *d*, Muscle-spot; magnified 5 diameters.
- 5 *a—d.* *Entomoconchus Scouleri*. Large specimen from Bolland. (Page 51.)
a, Profile, showing left valve; *b*, anterior; *c*, ventral; magnified $2\frac{1}{2}$ diameters. *d*, Muscle-spot; magnified 5 diameters.
- 6 *a—c.* *Entomoconchus Scouleri*. Small male (?) shell. From Bolland. (Page 51.)
a, Profile, showing right valve; *b*, front-view; *c*, ventral. Magnified $2\frac{1}{2}$ diameters.
- 7 *a—c.* *Entomoconchus orbicularis*, sp. nov. From Little Island, Cork. (Page 52.)
a, Profile, showing right valve; *b*, front-view; *c*, dorsal view. Magnified $2\frac{1}{2}$ diameters.



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C. West lith

M & R Hanhart sculp

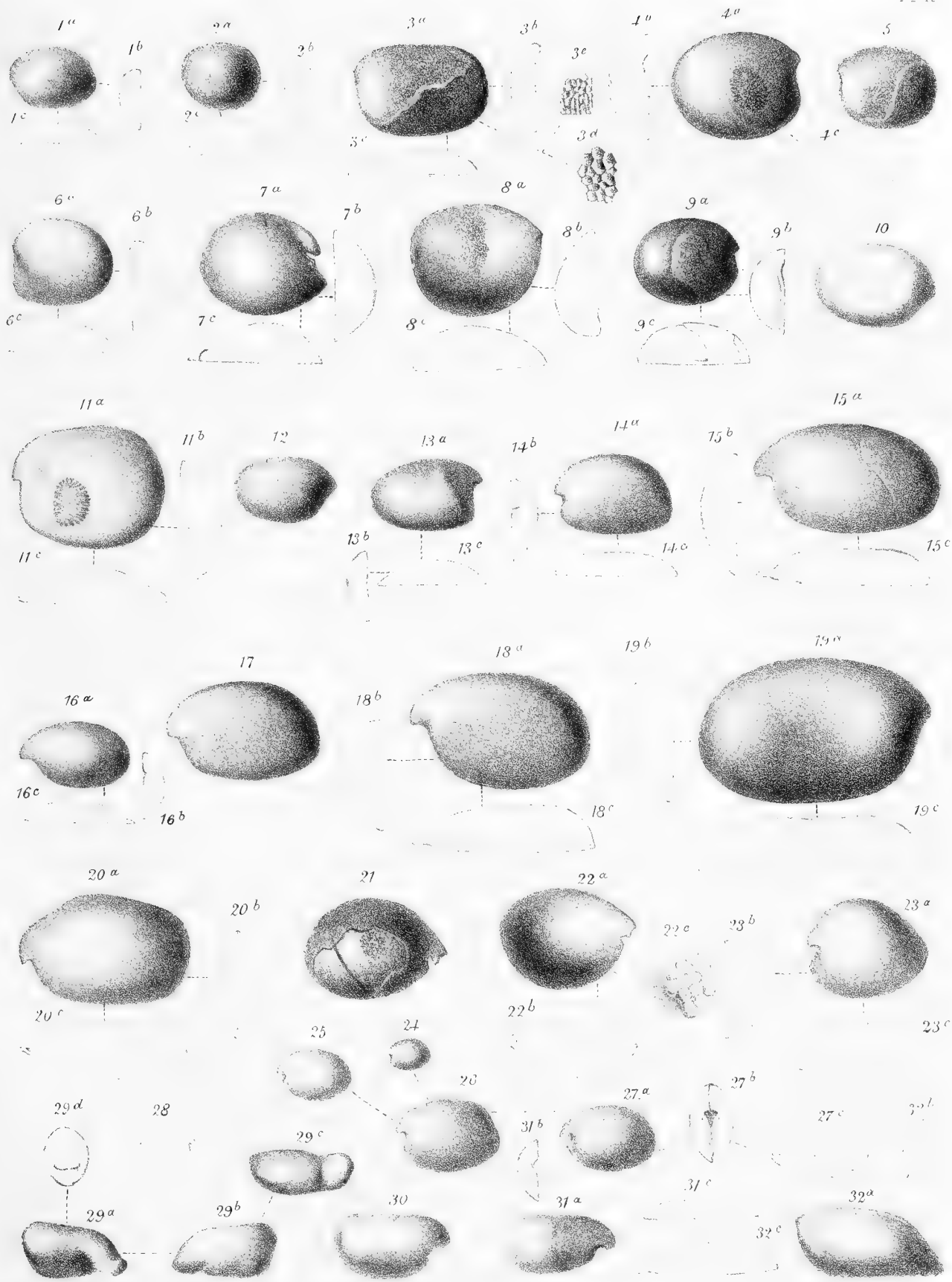
CARBONIFEROUS ENTOMOSTRACA.



PLATE II.

FIG.

- 1 a—c. *Polycope simplex*, Jones & Kirkby. Magnified 8 diameters. (Page 54.)
a, Left valve; b, end-view; c, edge-view. Retaining a film of shell. Carluke.
- 2 a—c. *Polycope Burrovii*, sp. nov. Magnified 4 diameters. (Page 54.)
a, Left valve; b, end-view; c, edge-view. Cast. Settle.
- 3 a—e. *Cypridina scoriacea*, J. & K. Shell. Carluke. (Page 20.)
a, Left valve; b, end-view; c, edge-view; magnified 4 diameters. d, Reticulated ornament near the centre; e, reticulated ornament near the margin; both magnified 18 diameters.
- 4 a—c. *Cypridina Phillipsiana*, Jones. With filmy remnant of shell. Carluke. (Page 18.)
a, Right valve; b, end-view; c, edge-view. Magnified 4 diameters.
5. *Cypridina Phillipsiana*, Jones. Part of the shell on a cast. Left valve. Magnified 4 diameters, Carluke. (Page 18.)
- 6 a—c. *Offa Barrandiana*, sp. nov. Shell. Cork. (Page 53.)
a, Left valve; b, front end-view; c, edge-view. Magnified 4 diameters.
- 7 a—c. *Cypridinella superciliosa*, sp. nov. Shell. Cork. (P. 22.)
a, Right valve; b, end-view; c, edge-view. Magnified 4 diameters. [The breast, or antero-ventral border, is imperfect.]
- 8 a—c. *Cypridina Thomsoniana*, J. & K. Shell. Gare. (Page 19.)
a, Right valve [slightly crushed at the notch]; b, hinder end-view; c, edge-view. Magnified 4 diameters. N.B.—The pitted ornament should have been continued all over the surface.
- 9 a—c. *Cypridina Phillipsiana*, Jones. Partly shell on cast. Carluke. (Page 18.)
a, Right valve; b, front end; c, ventral edge. Magnified 4 diameters.
10. *Polycope simplex*, J. & K. Shell. Cork. Right valve. Magnified 4 diameters. (Page 54.)
- 11 a—c. *Cypridina Youngiana*, J. & K. Cast. Gare. (Page 17.)
a, Left valve; b, front end; c, edge-view. Magnified 4 diameters.
12. *Polycope simplex*, J. & K. Cast. Meath. Right valve. Magnified 4 diameters. (Page 54.)
- 13 a—c. *Cypridina Bradyana*, sp. nov. Shell. Cork. (Page 15.)
a, Right valve; b, front end; c, edge-view. Magnified 4 diameters.
- 14 a—c. *Cypridina Wrightiana*, sp. nov. Shell. Cork. (Page 14.)
a, Left valve; b, front end; c, edge-view. Magnified 4 diameters.
- 15 a—c. *Cypridina brevementum*, sp. nov. Shell. Cork. (Page 16.)
a, Left valve; b, end-view; c, edge-view. Magnified 4 diameters.
- 16 a—c. *Cypridina brevementum*, sp. nov. Shell. Cork. (Page 16.)
a, Left valve; b, front end; c, edge-view. Magnified 4 diameters.
17. *Cypridina brevementum*, sp. nov. Shell. Cork. Left valve. Magnified 4 diameters. (Page 16.)
- 18 a—c. *Cypridina brevementum*, sp. nov. Shell. Park Hill, Longnor. (Page 16.)
a, Left valve; b, end view; c, ventral edge. Magnified 4 diameters.
- 19 a—c. *Cypridina brevementum*, sp. nov. Film of shell on cast. Park Hill, Longnor. (Page 16.)
a, Right valve (the beak is rather sharper than in the drawing); b, front edge; c, edge-view.
- 20 a—c. *Cypridina Grossartiana*, J. & K. Carapace. Carluke. (Page 17.)
a, Showing the left valve; b, end-view; c, ventral aspect. Magnified 4 diameters.
21. *Bradycinetus Rankinianus*, J. & K. Shell on cast. Gare. Right valve. Magnified 4 diameters. (Page 42.)
- 22 a—c. *Bradycinetus Rankinianus*, J. & K. Carapace. Gare. (Page 42.)
a, Right valve shown; b, ventral aspect (a & b, magnified 4 diameters); c, reticulate surface ornament; magnified 18 diameters.
- 23 a—c. *Cypridinella Cummingii*, sp. nov. Cast. Isle of Man. (Page 21.)
a, Left valve; b, end-view; c, edge-view. Magnified 4 diameters.
- 24—27 a—c. *Cypridina primæva*, M'Coy. Shells. Braidwood. Left valves and profiles. Magnified 4 diameters. (Page 12.)
28. *Cypridina primæva*, M'Coy. Cast. Permian limestone; Sunderland. Right valve. Magnified 4 diameters. (Page 13.)
29. Rolled fragment, figured by mistake. Cork. Magnified 4 diameters.
- 30, 31 a—c. *Philomedes (?) Bairdiana*, sp. nov. Shells. Cork. Right valves and profiles. Magnified 4 diameters. (Page 43.)
- 32 a—c. *Rhombina Hibernica*, sp. nov. Shell. Cork. (Page 44.)
a, Left valve (figured with the ventral edge upwards); b, end-view; c, ventral aspect. Magnified 4 diameters.

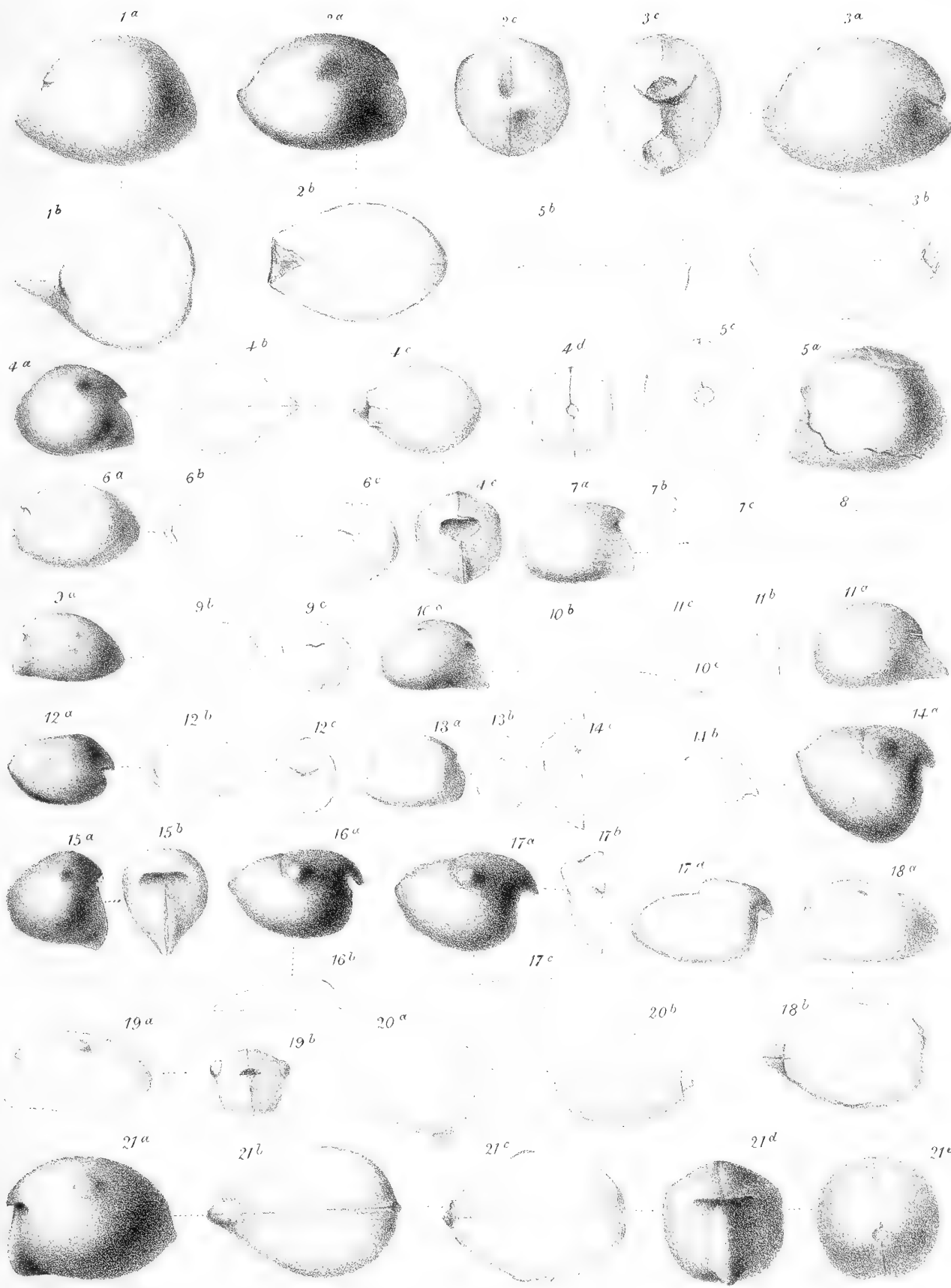


CARBONIFEROUS ENTOMOSTRACA

PLATE III.

FIG.

- 1 *a, b.* *Cypridinella monitor*, sp. nov. Cast. Visé. (Page 24.)
a, Left valve seen; *b*, dorsal aspect. Magnified 4 diameters.
- 2 *a—c.* *Cypridellina clausa*, sp. nov. Cast of carapace; imperfect at anterior extremity. Cork. (Page 27.)
a, Right valve; *b*, ventral aspect; *c*, posterior aspect. Magnified 4 diameters.
- 3 *a—c.* *Cypridinella clausa*, sp. nov. Cast of carapace, somewhat broken at both ends. Cork. (Page 23.)
a, Right valve shown; *b*, ventral aspect; *c*, anterior aspect. Magnified 4 diameters.
- 4 *a—e.* *Cypridellina Burrovi*, sp. nov. Cast of carapace. Settle. (Page 27.)
a, Right valve shown (the beak should be rather more definite); *b*, ventral aspect; *c*, dorsal aspect; *d*, posterior view; *e*, anterior aspect. Magnified 4 diameters.
- 5 *a—c.* *Cypridellina Burrovi*, sp. nov. Shell partially preserved on cast of carapace. Settle. (Page 28.)
a, Left valve shown (the beak is broken); *b*, ventral aspect; *c*, hinder end. Magnified 4 diameters.
- 6 *a—c.* *Cypridinella Bosqueti*, sp. nov. Cast of carapace. Visé. (Page 23.)
a, Left valve seen; *b*, dorsal aspect; *c*, front-view. Magnified 4 diameters.
- 7 *a—c.* *Cypridellina vomer*, sp. nov. Shell. Cork. (Page 25.)
a, Right valve; *b*, front-view; *c*, edge-view. Magnified 4 diameters.
8. *Cypridellina Burrovi* var. *Longnoriensis*, nov. Shell. Longnor, Derbyshire. Outline of the right valve. (Page 28.)
- 9 *a—c.* *Cypridellina elongata*, sp. nov., var. *Hibernica*, nov. Carapace. Cork. (Page 29.)
a, Left valve shown; *b*, ventral aspect; *c*, front aspect. Magnified 4 diameters.
- 10 *a—c.* *Cypridellina vomer*, var. *cultrata*, nov. Shell. Cork. (Page 30.)
a, Right valve; *b*, end-view; *c*, edge-view. Magnified 4 diameters.
- 11 *a—c.* *Cypridellina vomer*, sp. nov. Cast with remnant of shell. Cork. (Page 25.)
a, Right valve; *b*, front-view; *c*, edge-view. Magnified 4 diameters.
- 12 *a—c.* *Cypridella obsoleta*, sp. nov. Carapace, with shell reduced by weathering. Cork. (Page 34.)
a, Right valve shown; *b*, ventral aspect; *c*, front-view. Magnified 4 diameters.
- 13 *a, b.* *Cypridinella Maccoyiana*, sp. nov. Carapace. Cork. (Page 24.)
a, Right valve shown; *b*, front-view. Magnified 4 diameters.
- 14 *a—c.* *Cypridella Koninckiana*, Jones. Shell. Cork. (Page 34.)
a, Right valve; *b*, ventral aspect; *c*, front-view. Magnified 4 diameters.
- 15 *a, b.* *Cypridellina alta*, sp. nov. Carapace. Cork. (Page 31.)
a, Right valve shown; *b*, front-view. Magnified 4 diameters.
- 16 *a, b.* *Cypridella Koninckiana*, Jones. Shell. Cork. (Page 34.)
a, Right valve; *b*, ventral view. Magnified 4 diameters.
- 17 *a—d.* *Cypridella Koninckiana*, Jones. Shell. Cork. (Page 34.)
a, Right valve; *b*, end-view; *c*, ventral aspect; *d*, three-quarters view of valve obliquely placed, for comparison with other figures, as Pl. IV, fig. 6 *a*. Magnified 4 diameters.
- 18 *a, b.* *Cypridellina elongata*, sp. nov. Cast of carapace. Visé. (Page 29.)
a, Showing left valve; *b*, dorsal aspect. Magnified 4 diameters.
- 19 *a, b.* *Cypridellina elongata*, sp. nov. Cast of carapace. Visé. (Page 29.)
a, Showing left valve; *b*, front-view. Magnified 4 diameters.
- 20 *a, b.* *Cypridellina Bosqueti*, sp. nov. Cast of carapace. Visé. (Page 31.)
a, Showing right valve (the beak should be distinct, in a line with the tubercle); *b*, dorsal view (the anterior protuberance is an error). Magnified 4 diameters.
- 21 *a—e.* *Cypridellina Burrovi*, sp. nov. Cast of carapace. Settle. (Page 27.)
a, Showing left valve; *b*, ventral aspect; *c*, dorsal aspect; *d*, front-view; *e*, back-view. Magnified 4 diameters.



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G. West lith.

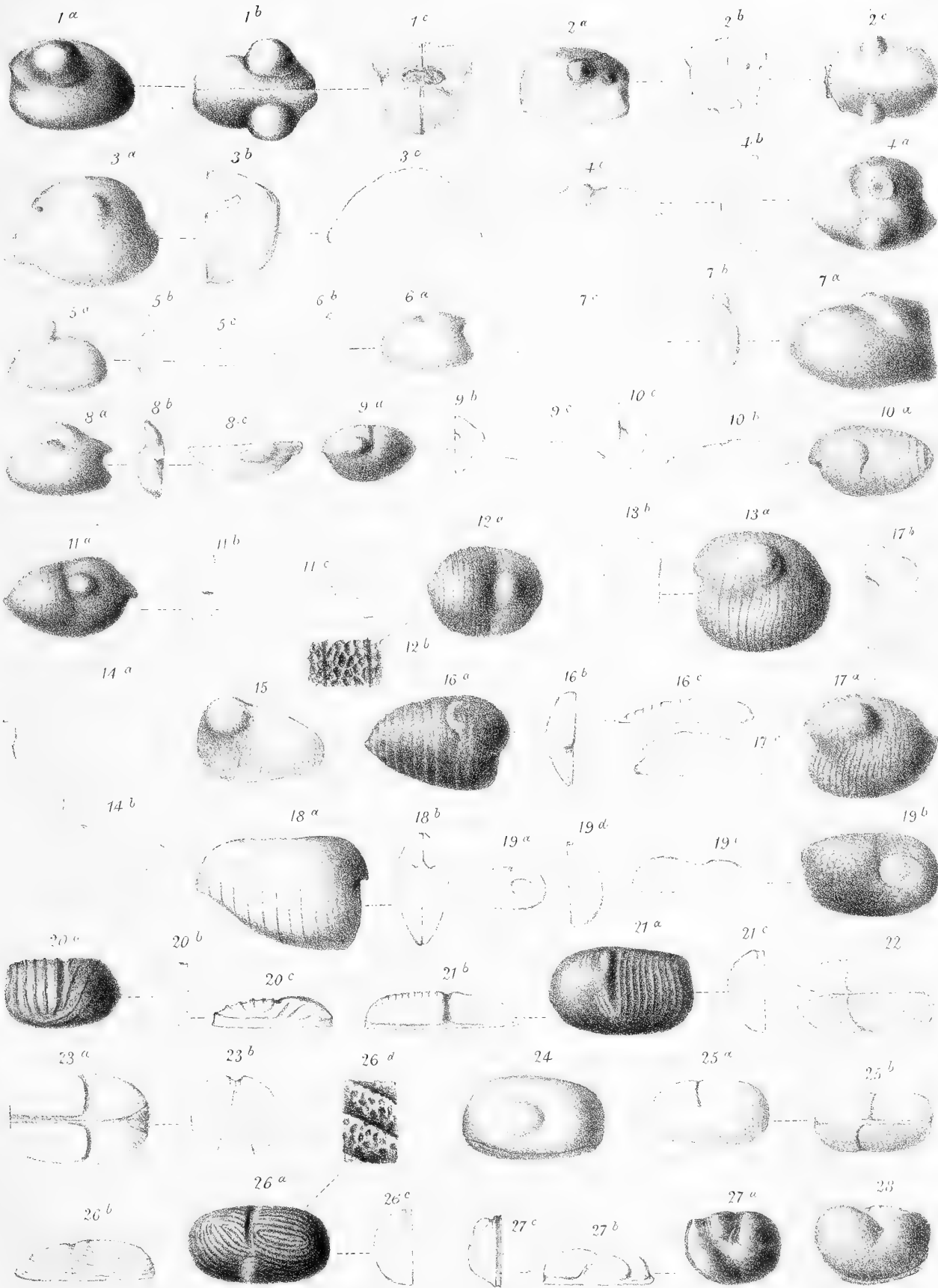
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CARBONIFEROUS ENTOMOSTRACA

PLATE IV.

FIG.

- 1 a—c. *Cypridella Wrightii*, sp. nov. Carapace. Cork. (Page 34.)
a, Left valve shown; b, dorsal aspect; c, front-view. Magnified 8 diameters.
- 2 a—c. *Cypridella quadrata*, sp. nov. Cast of carapace. Visé. (Page 35.)
a, Right valve seen (the transverse furrow is not well shown, nor the lateral indentation under the beak); b, front-view; c, dorsal-view (dorsal furrow not shown). Magnified 4 diameters.
- 3 a—c. *Cypridellina galea*, sp. nov. Shell. Cork. (Page 30.)
a, Left valve; b, front edge; c, ventral edge. Magnified 4 diameters.
- 4 a—c. *Cypridella Edwardsiana*, De Koninck, var. *septentrionalis*, nov. Shell. Cork. (Page 32.)
a, Right valve; b, front-view; c, dorsal edge. Magnified 4 diameters.
- 5 a—c. *Sulcuna cuniculus*, sp. nov. Shell. Cork. (Page 37.)
a, Left valve (antero-dorsal region is buried in the stone); b, end-view; c, edge-view. Magnified 4 diameters.
- 6 a, b. *Sulcuna lepus*, sp. nov. Shell. Cork. (Page 36.)
a, Right valve; b, end-view. Magnified 4 diameters.
- 7 a—c. *Sulcuna lepus*, sp. nov. Shell. Cork. (Page 36.)
a, Right valve (anterior end partially imbedded); b, end-view; c, edge-view. Magnified 4 diameters.
- 8 a—c. *Sulcuna cuniculus*, sp. nov. Shell. Cork. (Page 37.)
a, Right valve; b, end-view; c, edge-view. Magnified 4 diameters.
- 9 a—c. *Cypridellina cyprilloides*, sp. nov. Shell. Cork. (Page 36.)
a, Left valve; b, front end; c, edge-view. Magnified 4 diameters.
- 10 a—c. *Cyprrella chrysalidea*, De Koninck, var. *subannulata*, nov. Shell. Settle. (Page 38.)
a, Left valve; b, ventral view; c, front edge. Magnified 4 diameters.
- 11 a—c. *Cyprrella chrysalidea*, De Koninck, var. *subannulata*, nov. Shell. Cork. (Page 39.)
a, Right valve; b, front aspect; c, ventral aspect. Magnified 4 diameters.
- 12 a, b. *Cyprrella annulata* (De Koninck). Shell. Cork. (Page 40.)
a, Right valve, magnified 4 diameters. b, Reticulate ornament, magnified 20 diameters).
- 13 a, b. *Cyprrella annulata* (De Koninck). Shell. Settle. (Page 41.)
a, Left valve; b, front-view. Magnified 4 diameters.
- 14 a, b. *Cyprrella chrysalidea*, De Koninck. Cast of carapace. Visé. (Page 38.)
a, Showing left valve; b, dorsal view of both valves, open. Magnified 4 diameters.
15. *Cyprrella chrysalidea*, De Koninck. Cast of the left valve; imperfect. Visé. Magnified 4 diameters. (Page 38.)
- 16 a—c. *Cyprrella chrysalidea*, De Koninck. Shell. Settle. (Page 39.)
a, Right valve; b, front-view; c, edge-view. Magnified 4 diameters.
- 17 a—c. *Cyprrella annulata* (De Koninck). Shell. Cork. (Page 40.)
a, Left valve; b, front edge; c, ventral edge. Magnified 4 diameters.
- 18 a, b. *Cyprrella chrysalidea*, De Koninck. Compressed cast of carapace. Visé. (Page 38.)
a, Right valve (the outline of hood and tubercle not indicated); b, front-view.
- 19 a—d. *Entomis obscura*, sp. nov. Worn shell. Cork.
a, Right valve, magnified 4 diameters. b, The same, magnified 8 diameters. c & d, end-view and edge-view, magnified 8 diameters.
- 20 a—c. *Entomis Koninckiana*, sp. nov. Shell. Settle.
a, Right valve, somewhat imperfect at the antero-dorsal corner; b, end-view; c, ventral aspect. Magnified 4 diameters.
- 21 a—c. *Entomis Burrovi*, sp. nov. Shell. Settle.
a, Left valve; b, dorsal view; c, end-view. Magnified 4 diameters.
22. *Entomis concentrica* (De Koninck). Carapace. Visé. Dorsal aspect in outline. Magnified 4 diameters.
- 23 a, b. *Entomis biconcentrica*, Jones. Carapace. Cork.
a, Dorsal aspect, in outline; b, end-view of the same open carapace, in outline. Magnified 4 diameters.
24. *Entomis obscura*, sp. nov. Cast. Settle. Right valve. Magnified 4 diameters.
- 25 a, b. *Entomis concentrica* (De Koninck). Cast of carapace. Visé.
a, Left side; b, dorsal view. Magnified 4 diameters.
- 26 a—d. *Entomis biconcentrica*, Jones. Shell. Cork.
a, Left valve; b, edge-view; c, end-view; a, b, c, magnified 4 diameters. d, Reticulate and ridged surface; magnified 25 diameters.
- 27 a—c. *Beyrichia gigantea*, sp. nov. Shell partly preserved on cast. Longnor, Derbyshire.
a, Left valve; b, edge-view; c, end-view. Magnified 4 diameters.
28. *Beyrichia gigantea*, sp. nov. Shell. Cork. Right valve. Magnified 4 diameters.



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CARBONIFEROUS ENTOMOSTRACA.

PLATE V.

- 1 *a—d.* *Polycope simplex*, Jones & Kirkby. Shells. Braidwood. Carluke. (Page 55).
a, Left valve; *b*, edge-view; *c*, left valve of a smaller specimen; magnified 8 diameters. *d*, Part of surface; magnified 40 diameters.
- 2 *a—f.* *Polycope Youngiana*, sp. nov. Shell represented by pyrites. Campsie. (Page 56.)
a, Left valve; *b*, edge-view of carapace; *c*, end-view; magnified 8 diameters. *d, e, f*, Portions of the surface; magnified 40 diameters.
- 3 *a—c.* *Cypridina Hunteriana*, sp. nov. Cast. Braidwood. (Page 18.)
a, Left valve; *b*, front end of carapace; *c*, edge-view,
4. *Cypridina Thompsoniana*, sp. nov. Gare. Portion of the surface, highly magnified. (Page 19.)
5. *Bradycinetus Rankinianus*, J. & K. Gare. The beak, magnified. (Page 42.)
- 6 *a—f.* *Cypridina radiata*, sp. nov. Shells. Airdrie. (Page 14.)
a, Left valve; *b*, edge-view; *c*, end-view; magnified 4 diameters. *d & e*, Portions of shell; magnified 40 diameters. *f*, A right valve, misshapen by pressure, and showing the layers of shell; magnified 8 diameters.
- 7 *a—d.* *Cypridinella superciliosa*, sp. nov. Shell. Bathgate. (Page 22.)
a, Right valve; *b*, ventral edge of valve; *c*, front view of carapace; magnified 4 diameters. *d*, Superficial markings; magnified 40 diameters.
- 8 *a—c.* *Cypridellina intermedia*, sp. nov. Shell. Bathgate. (Page 29.)
a, Left valve; *b*, edge-view; *c*, end-view. Magnified 4 diameters.
- 9 *a—c.* *Cypridina pruniformis*, sp. nov. Cast. Limerick? (Page 19.)
a, Right valve; *b*, ventral; *c*, front. Magnified 4 diameters.
- 10 *a—g.* *Entomoconchus globosus*, sp. nov. Shell. West Broadstone, Beith, Ayrshire. (Page 52.)
a, Right valve; *b*, ventral aspect; *c*, front-view; *d*, posterior; magnified 4 diameters. *e*, Muscle-spot; magnified 2½ diameters. *f & g*, Parts of surface; magnified 40 diameters.
- 11 *a—c.* *Cypridella Edwardsiana* (De Koninck), var. *septentrionalis*, nov. Shell. Beith, Ayrshire. (Page 33.)
a, Left valve; *b*, edge-view; *c*, end-view. Magnified 8 diameters.
- 12 *a—c.* *Cypridina oblonga*, sp. nov. Shell. Cork. (Page 20.)
a, Left valve; *b*, edge-view; *c*, end-view. Magnified 4 diameters.
- 13 *a—c.* *Rhombina Hibernica*, sp. nov. Shell. Cork. (Page 44.)
a, Left valve; *b*, edge-view; *c*, end-view. Magnified 4 diameters.
- 14 *a—d.* *Rhombina Belgica*, sp. nov. Shell. Visé, Belgium. (Page 44.)
a, Left valve; *b*, edge-view; *c*, end-view; magnified 4 diameters. *d*, Superficial markings; magnified 40 diameters.

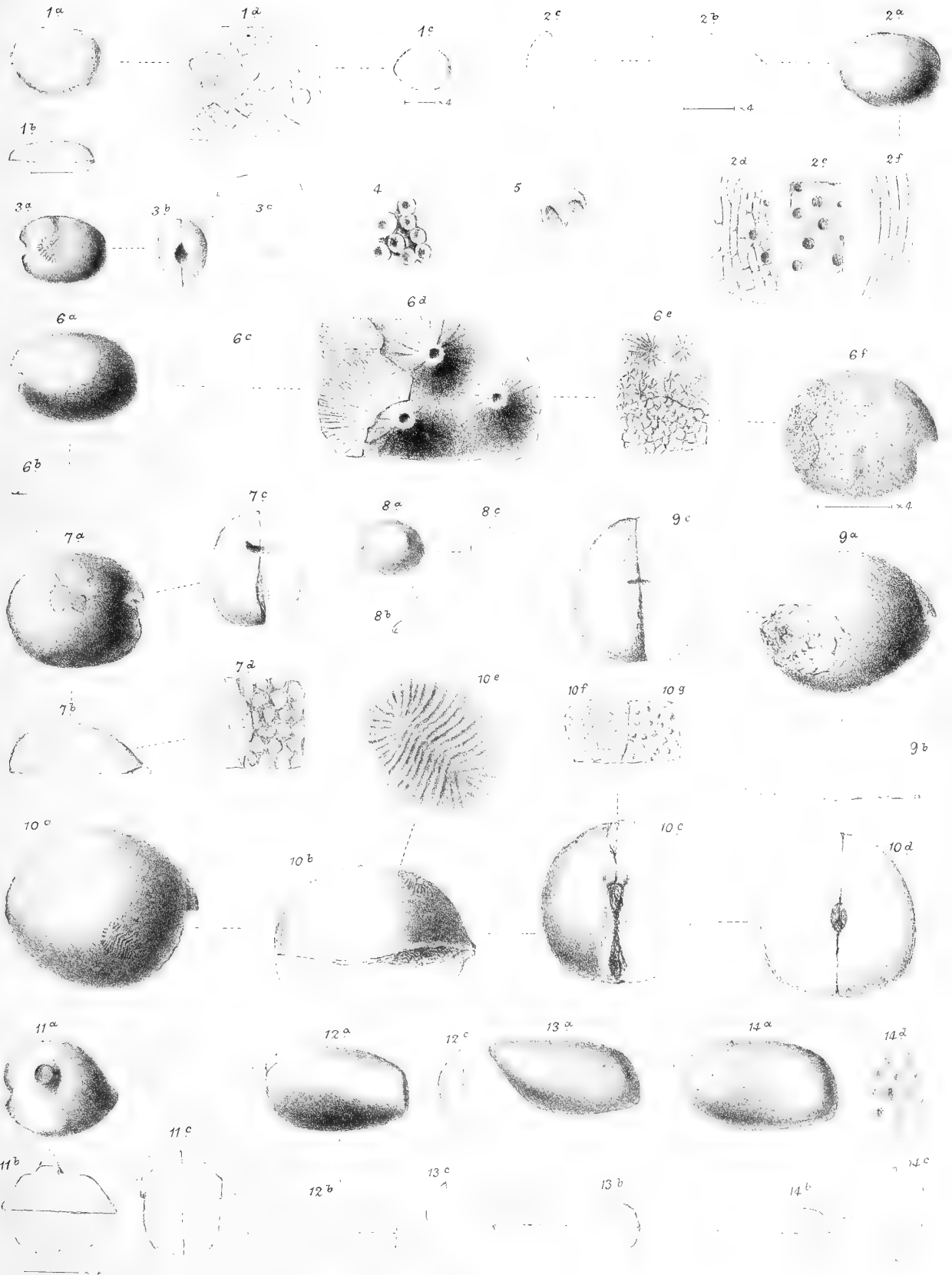


PLATE VI.

All the specimens are magnified 25 diameters, except figs. 1 *a*, *b*.

- FIG.
- 1 *a—c*. *Cypridina (Philomedes) elongata*, sp. nov. Clay-cross Colliery, Derbyshire. (Page 81.)
a, Left valve, and *b*, ventral view (without the hook), magnified 5 diameters; *c*, portion of the surface, magnified 25 diameters.
 - 2 *a—c*. *Cytherella valida*, sp. nov. Calees, East Cumberland. (Page 70.)
a, Right valve; *b*, left valve; *c*, ventral view.
 - 3 *a*, *b*. *Cytherella Benniei*, sp. nov. Mouse-Water, Lanarkshire. (Page 70.)
a, Left valve; *b*, ventral view.
 - 4 *a*, *b*. *Cytherella Benniei*, sp. nov. Calterside, Lanarkshire. (Page 70.)
a, Right valve; *b*, ventral view.
 - 5 *a*, *b*. *Cytherella Benniei*, sp. nov. Calterside, Lanarkshire. (Page 70.)
a, Left valve; *b*, dorsal view.
 - 6 *a*, *b*. *Cytherella recta*, sp. nov. Auchenberg Old Quarry, Lanarkshire. (Page 71.)
a, Left valve; *b*, ventral view.
 - 7 *a*, *b*. *Cytherella Benniei*, sp. nov. Large individual. Kennoway Den, Fifeshire. (Page 70.)
 - 8 *a*, *b*. *Cytherella brevis*, Jones. Campsie, Stirlingshire. (Page 72.)
a, Right valve; *b*, edge view.
 9. *Cytherella concinna*, sp. nov. From David Ure's specimens in the Hunterian Museum, Roy. Coll. Surgeons, London. (Page 71.)
 - 10 *a—e*. *Cytherella scrobiculata*, sp. nov. *a*, From David Ure's specimens in the Hunterian Museum, Roy. Coll. Surgeons, London; *b*, *c*, *d*, and *e*, from Robroyston, Lanarkshire. (Page 76.)
a, Left valve; *b*, right valve, rather crushed; *c*, right valve; *d*, left valve; *e*, dorsal view.
 - 11 *a*, *b*. *Cytherella recta*, sp. nov. Wilsontown, Lanarkshire. (Page 71.)
a, Left valve; *b*, dorsal view.
 - 12 *a*, *b*. *Cytherella concinna*, sp. nov. Holwell, Somerset. (Page 71.)
a, Right valve; *b*, ventral view.
 - 13 *a*, *b*. *Cytherella Hibernica*, sp. nov. Cultra, County Down, Ireland. (Page 72.)
a, Right valve; *b*, edge view.
 - 14 *a*, *b*. *Cytherella æqualis*, sp. nov. Great Orme Head, North Wales. (Page 74.)
a, Side view; *b*, dorsal view.
 - 15 *a*, *b*. *Cytherella æqualis*, sp. nov. Gare, Lanarkshire. (Page 74.)
a, Side view; *b*, dorsal view.
 - 16 *a*, *b*. *Cytherella æqualis*, sp. nov. Gare, Lanarkshire. (Page 74.)
a, Side view; *b*, dorsal view.
 - 17 *a*, *b*. *Cytherella Benniei*, var. *Iowensis*. Upper Coalmeasures; Iowa, North America. (Page 77.)
a, Left valve; *b*, ventral view.
 - 18 *a*, *b*, *c*. *Cytherella subreniformis*, sp. nov. Fusulina-limestone; Iowa, North America. (Page 79.)
a, Left valve; *b*, right valve, interior; *c*, ventral view.
 - 19 *a*, *b*. *Cytherella concinna?* Fusulina-limestone; Iowa, North America. (Page 79.)

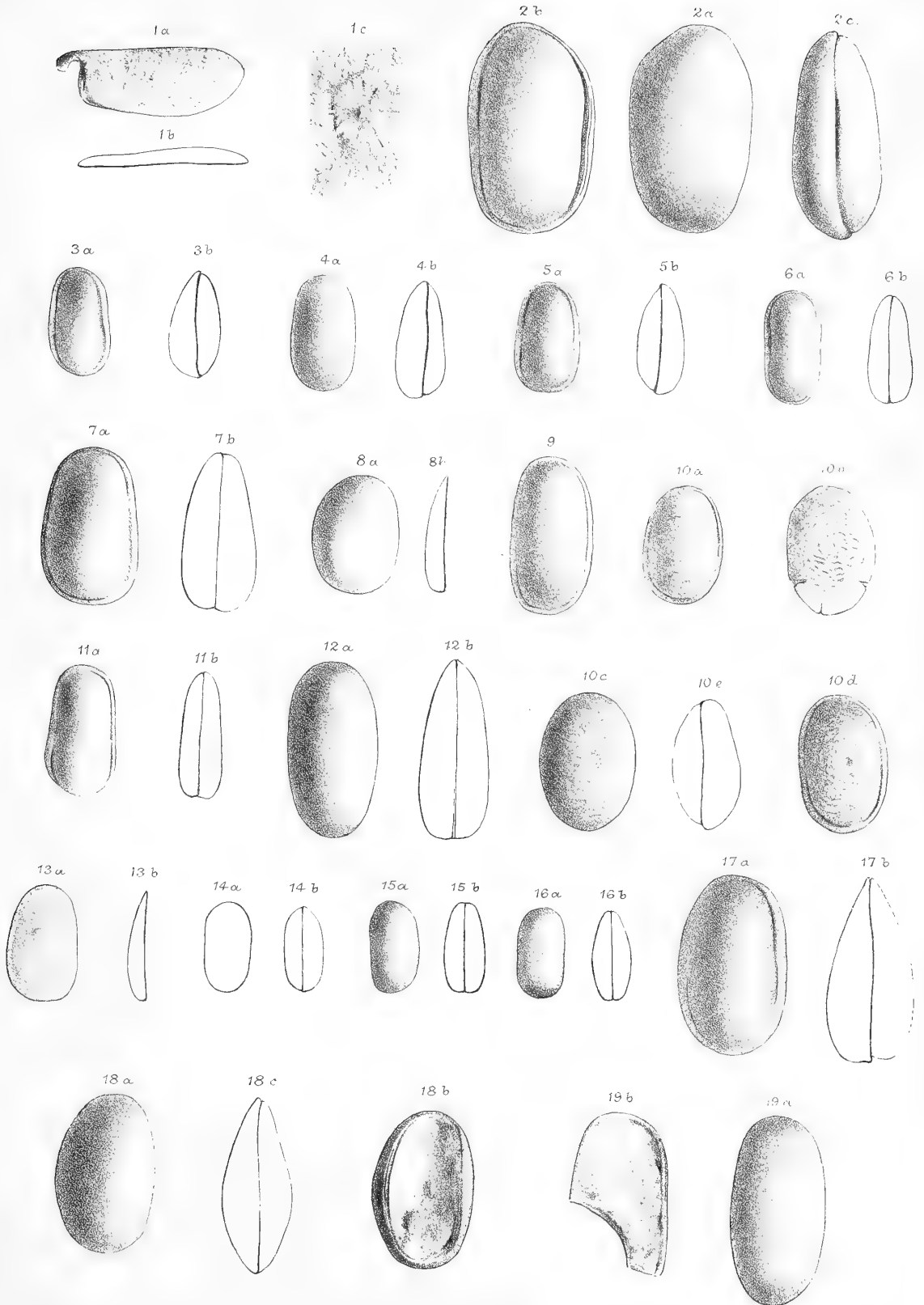


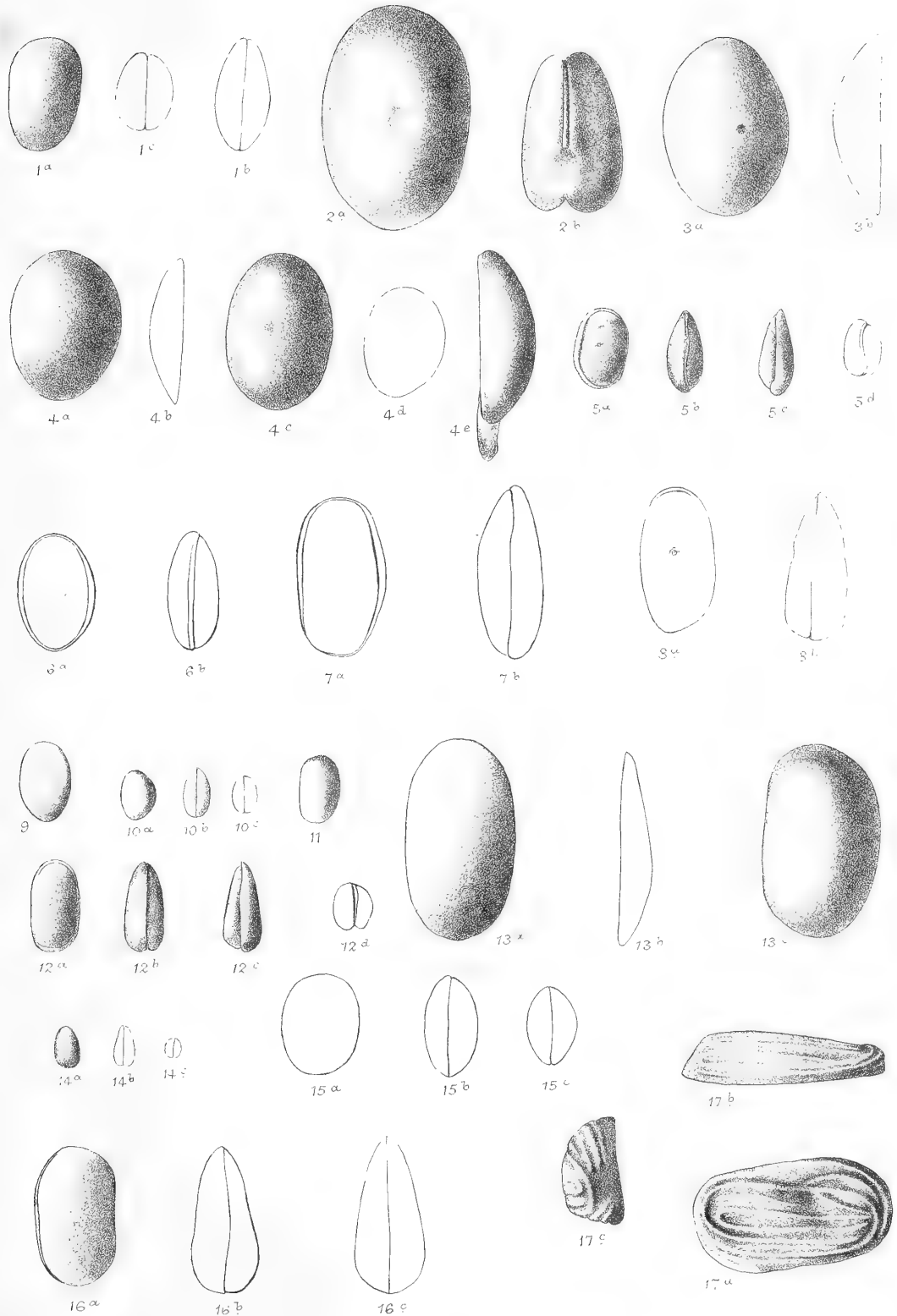


PLATE VII.

All the specimens are magnified 25 diameters.

FIG.

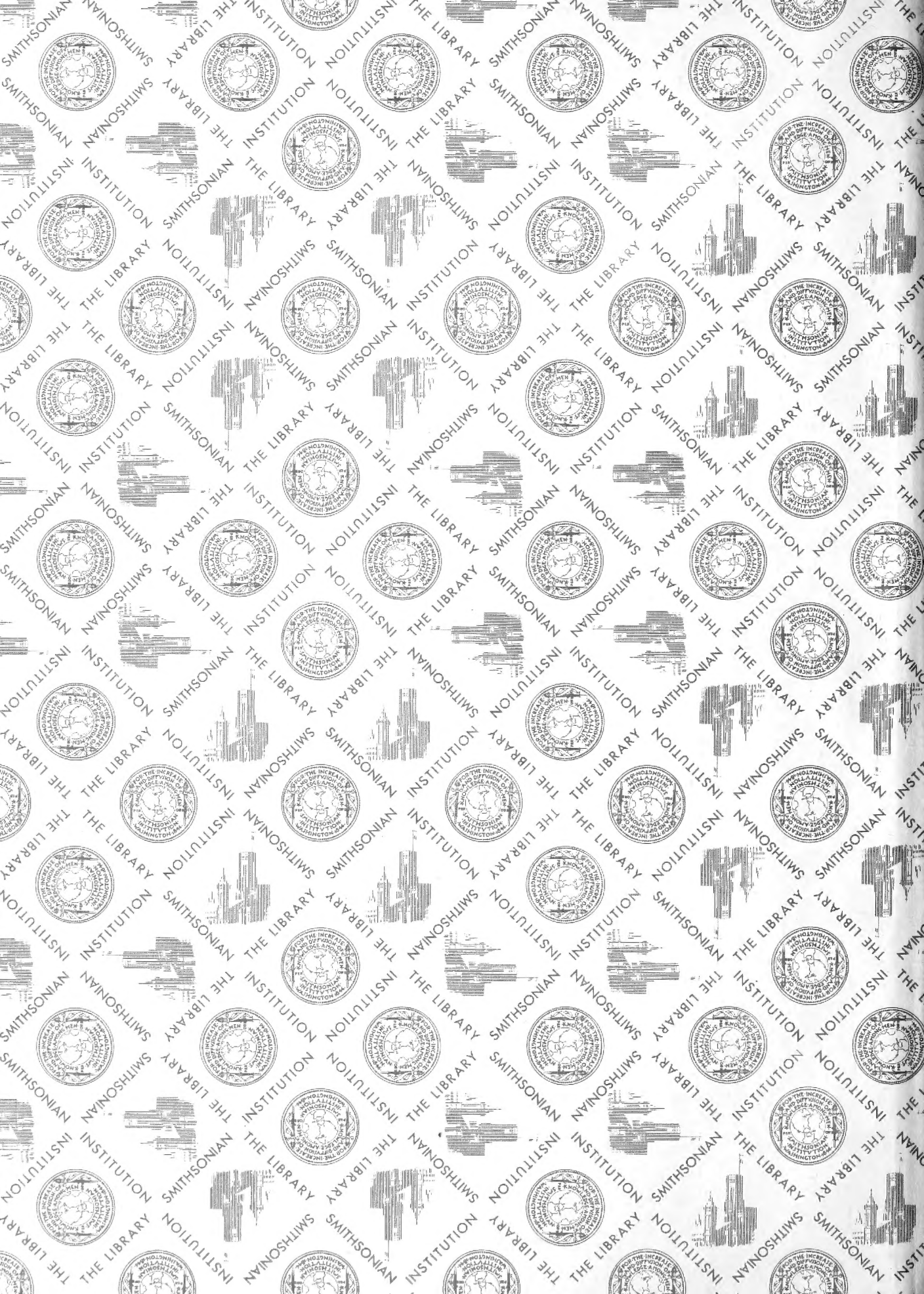
- 1 *a—c.* *Cytherella Tatei*, Jones. Lamberton, Northumberland. (Page 74.)
a, Right valve; *b*, ventral view; *c*, end view.
- 2 *a, b.* *Cytherella? inflata*, Jones and Kirkby. Craigenglen, Stirlingshire. (Page 74.)
a, Right valve; *b*, end view.
- 3 *a, b.* *Cytherella simplex*, Jones and Kirkby. Raes Gill, Lanarkshire. (Page 75.)
a, Right valve; *b*, edge view.
- 4 *a—e.* *Cytherella Richteriana*, sp. nov. Devonian; Saalfeld, Germany. (Page 80.)
a, c, d, Right valves; *b, e*, edge views.
- 5 *a—d.* *Cytherella obliquata*, G. S. Brady, MS. Capelrig Quarry, Lanarkshire. (Page 73.)
a, Left valve; *b*, ventral view; *c*, dorsal view; *d*, end view.
- 6 *a, b.* *Cytherella regularis*, sp. nov. Fusulina-limestone; Iowa, North America. (Page 78.)
a, Left valve; *b*, ventral view.
- 7 *a, b.* *Cytherella Benniei*, var. *intermedia*. Upper Coalmeasures; Iowa, North America. (Page 78.)
a, Left valve; *b*, dorsal view.
- 8 *a, b.* *Cytherella impressa*, sp. nov. Fusulina-limestone; Iowa, North America.
a, Left? valve; *b*, dorsal view. (Page 79.)
9. *Cytherella regularis*, var. ? Danville, Illinois, North America. (Page 78.)
- 10 *a, b, c.* *Cytherella? obesa*, sp. nov. West Broadstone, Ayrshire. (Page 75.)
a, Right valve; *b*, dorsal view; *c*, end view.
11. *Cytherella*, sp. indet. Wyebourne, Cumberland. (Page 75.)
- 12 *a, b, c, d.* *Cytherella Benniei*, sp. nov. Swinehill Colliery, near Lanark. (Page 70.)
a, Left valve; *b*, ventral view; *c*, dorsal view; *d*, end view.
- 13 *a, b, c.* *Cytherella*, sp. indet. (near *C. valida*). Carluke, Lanarkshire. (Page 76.)
a, b, c, side and edge views of casts.
- 14 *a, b, c.* *Cytherella nuciformis*, Jones. Permian; Sunderland, Durham. (Page 73.)
a, Right valve; *b*, dorsal view; *c*, end view.
- 15 *a, b, c.* *Cytherella? rotundata*, sp. nov. Mayfield Quarry, Dalkeith, Midlothian. (Page 76.)
a, b, c, Outlines of a testiferous specimen.
- 16 *a, b, c.* *Beyrichia? sp.* Randerstone, Fife. (Page 88.)
a, Left valve; *b*, ventral view; *c*, dorsal view.
- 17 *a, b, c.* *Kirkbya costata?* Brockley, Lanarkshire. (Page 89.)
a, Right valve; *b*, edge view; *c*, end view.

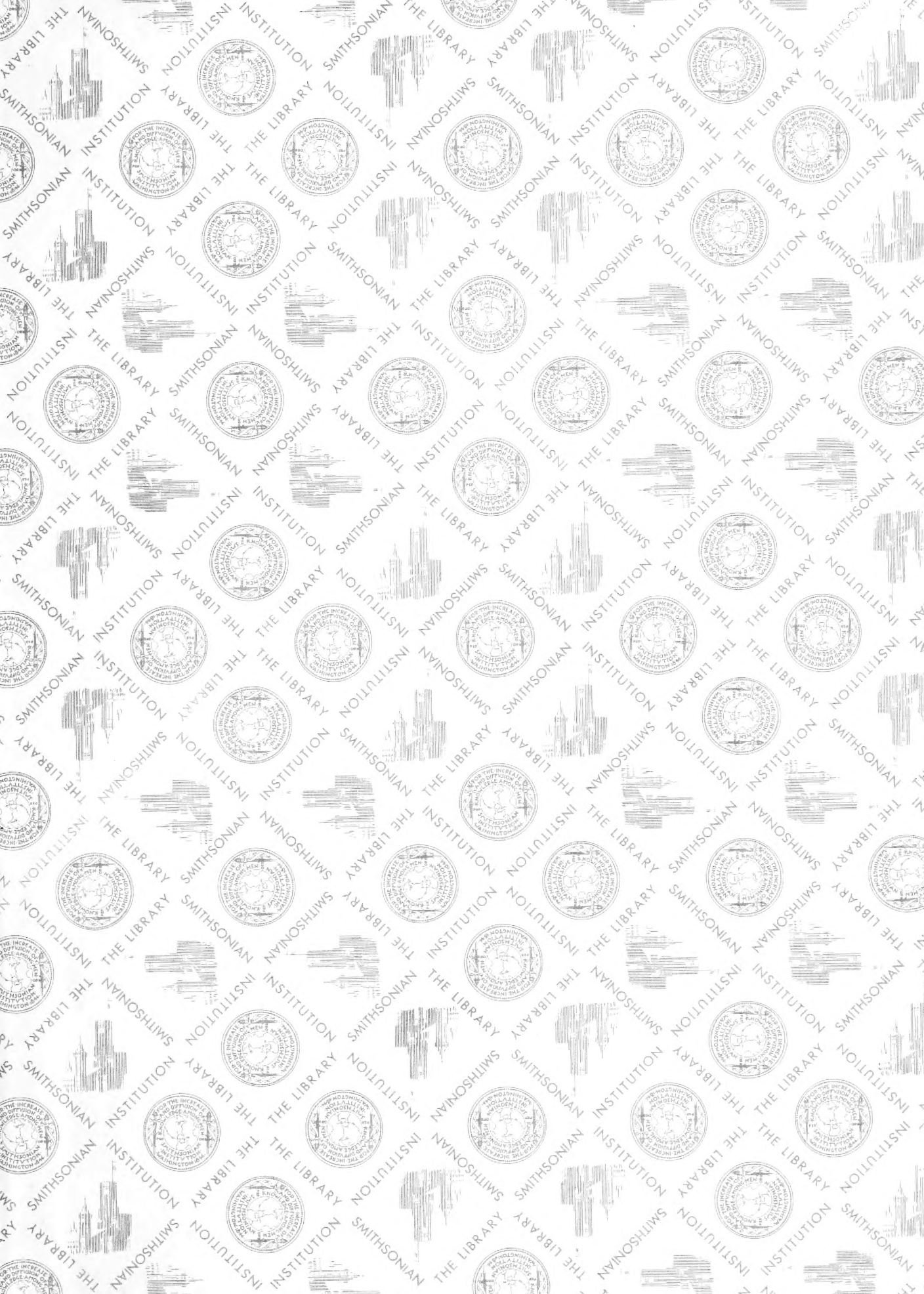


Long time

4







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